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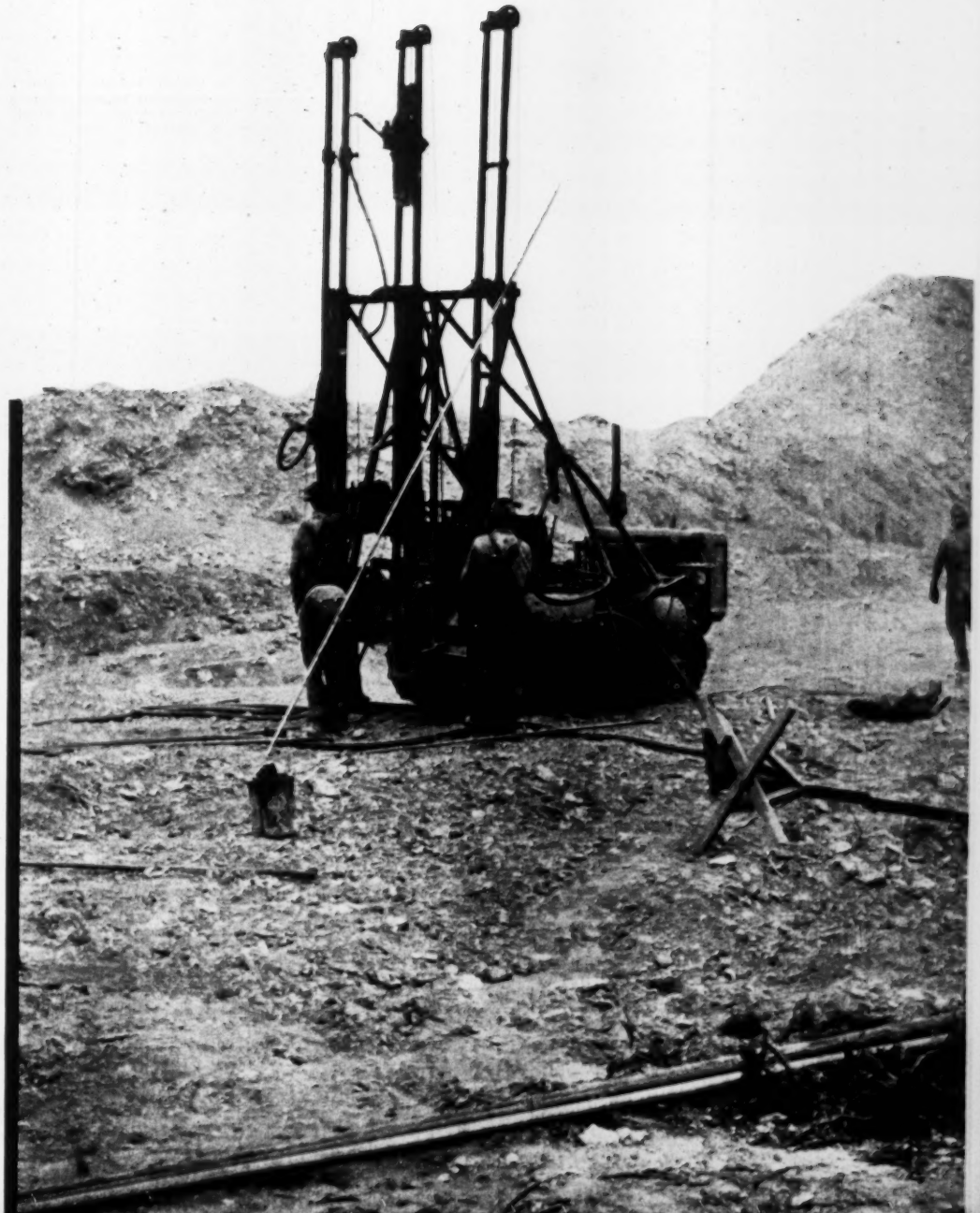

Lift Bridge of 534-ft. Span

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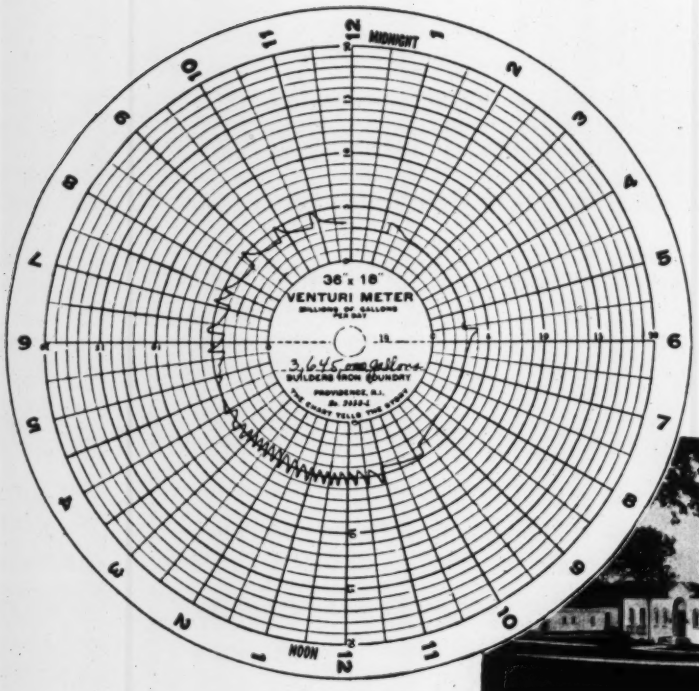

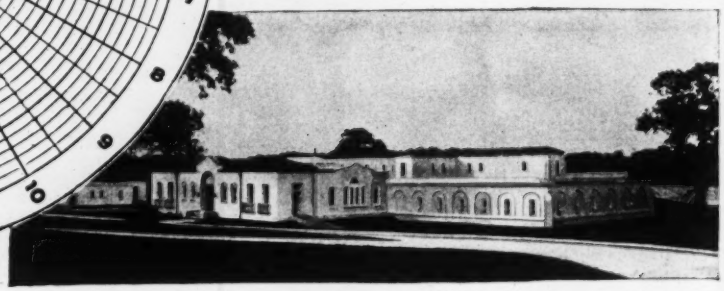

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DEVOTED TO CIVIL ENGINEERING AND CONTRACTING

F. E. SCHMITT, *Editor*

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Invisible Government

MENTION of the evil effects of "invisible government," the influence of selfish interests in relation to public works, by a committee investigating Chicago school buildings lays stress on a vicious condition that appears to be growing and that affects the cost and efficiency of municipal affairs. It is as serious as open political interference with engineering departments and governmental bodies. In the Chicago case (*E.N-R.*, April 23, p. 704) the committee gave no specific instances of such sinister control in the board of education, but its effects are glaringly evident in disorganization of staff and in defective construction work carried out under the eyes of official inspectors. Contributory to this condition, no doubt, have been the continued dissensions and internal political controversies that have characterized the board in recent years. But when matters get to the point where costly buildings just finished are unsafe for occupancy it is time for thoroughgoing reform.

Not Overbuilt

SECRETARY of Commerce Lamont in an address before the Chamber of Commerce of the United States two weeks ago challenged the abnormal pessimism that many have voiced in recent months and that considers the world to be overbuilt. He spoke soundly. He showed that experience fully disproves the underlying assumptions reflected in the cant terms "overproduction" and "technological unemployment." Quoting from a report of the U. S. Commissioner of Labor written in 1886, he brings out statements that could not be surpassed by the best pessimists of today in their hopelessness of outlook. "The rapid development and adaptation of machinery have brought overproduction," said the report, and then proceeded to give instances of the displacement of labor by machines. In Europe as well as here, it continued, the world's work of construction had been largely completed. "Railroad construction has been out of all proportion to the increase of products. Harbors and rivers are sufficiently developed, and warehouses, water and gas works, tramways, are largely provided for; the Pyrenees and the Alps are tunneled and the Suez Canal has been built. . . . It will not leave room for marked extension." Yet with a world so overbuilt and so overstocked forty-five years ago we went forward to its complete rebuilding and restocking. As Secretary Lamont dryly remarks, the commissioner wrote in an age of zinc bathtubs, Brussels carpets, kerosene lamps, horse cars and mud roads. We have to make the same reflection today, and look forward to wholly new customs and requirements, larger works, better facilities and conveniences. Construction has far more to do in the future than it wrought in the past, and pessimism or talk of overproduction and overbuilding is sheer error.

Halfway Reform

PLACING water companies under public-utility regulation, as has just been done in New York (see May 7, p. 779), is a proper reform, but it is highly unfortunate in its incompleteness. Had municipal water departments also been ranked as utilities and placed under regulatory supervision a far larger gain to the public would have resulted. Water department finances, rates and regulations are the weak element of what on the whole is the most ably managed part of public service, and the responsibility for this weakness rests not on the direct engineering and administrative direction but on lack of understanding and competence elsewhere in the municipal machinery. City water history in every part of the country illustrates this, with only isolated exceptions. Failure to proportion charges to cost of service, indifference to adequate metering, crippling of the water service by diversion of revenue needed for maintenance and improvement, are among the common evils. Were utility control methods applied to all water accounting and handling of funds, the citizens would gain far more than through regulation of companies only. The standards of water service and the work of the engineer in raising them would be promoted.

Against Public Interest

COMPTROLLER GENERAL McCARL'S surprising reversal of his initial decision against the Boston post office contract (our issue of April 23, p. 701) gives sanction of legality to a practice of bid chiseling that in municipal and even in private work would be condemned. The original call for bids to build the post office requested alternates, one for all granite facing, and the other for part limestone. Bids on the latter were within the available funds, while the former proved too costly by nearly a million dollars. Previously Congress had refused to increase its appropriation to allow all granite construction. Nevertheless the Treasury Department, on the demand of local interests, decided for granite *after bids were open*. It now had to find ways of reducing the cost of the building by one-fifth. To do this it cheapened the design and specifications in various ways, and called for supplemental bids. The lowest proposal still being too high, the plans were again revised, and finally on a second set of bids and deductions it managed to obtain an acceptable proposal. As we reported three weeks ago, the

Comptroller rightfully objected, declaring that the work should have been readvertised in view of the major character of the revision; but subsequently he approved the contract as legal, apparently under pressure from the Treasury Department. This decision sets an evil precedent; the principle of firm bidding is given a body blow. Did similar manipulation of bids occur in a municipal contract there would be no lack of charges of graft and favoritism, and naturally so, since competition is made a mockery. The Comptroller himself recognized the principle strongly enough to accompany his approval with a sharp rebuke to the Treasury, saying that its procedure is unfair to bidders. He might have added that it is equally unfair to the public, and that the federal government is setting a bad example to other public bodies and to private business.

Safety of Old Buildings

RECENT prevention of possible roof failures in Wisconsin, as the result of official inspections, serves to call attention again to the desirability of systematic periodical inspection of old buildings in order to detect and correct corrosion, defects or unauthorized alterations that may affect stability and safety. Such a requirement was noted in our issue of July 17, 1930, p. 81, in connection with failures of several old buildings. In the Wisconsin state bureau of engineering one of the functions of the industrial division is the inspection and investigation of structural conditions in buildings used by the public. According to the latest quarterly report, in two such buildings, one of them a theater, the timber roof trusses were found to be badly rotted at the wall bearings. The inspections led to prompt repairs, which may have prevented serious accidents. But such systematic technical investigation is rare in city and state practice; those building and fire departments that number periodic inspection of old buildings among their duties too often are handicapped by lack of funds or inadequate personnel. It is much more gratifying to report that a building collapse has been averted than to publish a list of dead and injured. And it is more constructive. Wide adoption of the Wisconsin practice of examining old buildings would be a distinct advance.

Looking Ahead

IS ADEQUATE thought being given to the location of bus and truck terminals in our cities? Shall we live to see the day when we shall regret that more forethought was not given to the placing of these facilities? Today we look back in wonderment at the way in which our forefathers granted perpetual rights to the early railroads, only to have them develop into a burden upon the following generations. Take Syracuse as an example. Years have been spent in trying to get the New York Central tracks off one of the principal streets of the city, a position which they occupy by right of a grant made with open hand almost a century ago. A study of the way in which bus, and to a lesser extent truck, terminals are being located about our cities seems to indicate a similar lack of planning for the future. True, the conditions surrounding the operation of motor vehicles are quite different from those of railway operation, but equally difficult problems may arise. Even now some cities exclude trucks from certain streets because of too great interference with other traffic, and a few have already restricted intercity buses. If growth of traffic should require these vehicles to be kept out of certain zones in the future, ought not some attempt be made now to simplify that change by restricting the establishment of terminals within those zones? This and like questions are worthy of being considered soon rather than later. Undue restriction of facilities still in evolution is harmful, but it may be equally harmful to give no thought to salutary limitation of practices whose bad results are already becoming evident.

A Step Forward

SIMULTANEOUS announcement of new series of wide-flange I-beams by the United States Steel Corporation and the Bethlehem Steel Co. brings a gratifying surprise. It appears that the two companies have arrived at nearly complete standardization of these shapes, and not merely as an academic matter of handbook listing but in a definitely practical way. Their present discordant series are to be removed from the market; production of the new shapes begins at once and rolling of the old shapes will come to an end within two months. The change is a long step forward. It will bring decided savings of cost and labor as well as a gain in convenience to the entire structural-steel-using field. It ranks high as an achievement in technical simplification.

For years the divergence of the wide-flange-beam series of the two companies, which are the only American producers, has been a vexation and a source of loss to all concerned—engineer and user as well as mill fabricator. Especially was this the case in city building work. Every design had to be worked out initially for one of the two series, but in the subsequent bidding the structure had to be redesigned for the other series if full competition was to be obtained. This meant not only delay and extra cost but also, since neither area nor resisting moment could be duplicated exactly, it gave occasion for disputes and friction. Either series was excellent in itself; together they were much less excellent, because they differed.

Not only beams but also columns were involved, and in fact the latter were particularly troublesome. Certain column sections were convenient for splicing by virtue of constancy of outside depth over a range of weights; others were convenient for girder connections by having constant inside depth; some simplified the details by having parallel flange faces, while others had taper flanges. Under these conditions the redesign often meant thoroughgoing replanning of major elements of the structural scheme. The intrinsic excellence of the wide-flange sections thus suffered a quite needless discount.

All of these sources of trouble have been eliminated in the new series. Column sections are identical throughout, in depth, width, and thickness of metal, and have parallel flange faces. All maintain constant inside depth in each size, for uniformity of connection details; the principle of constant outside depth is discarded. Fillers at splices and slight variation in girder length are trifling disadvantages compared with the gain through uniform details for girder connections between flanges. Beam sections are identical in depth, weight and other properties, except in the 21- to 28-in. range, an exception of minor importance compared with the standardization below 21 in. A slight difference in flange form remains, but this is not of practical importance.

Nothing has occurred in the development of rolled

shapes for two or three decades that ranks with this accomplishment. It calls to mind the far-reaching effects of the design of a standard series of beams and channels worked out by the Association of American Steel Manufacturers some thirty-five years ago. By virtue of its excellence and simplicity, that series was an unmistakable factor in bringing about rapid progress of structural engineering as well as of mill practice. Its influence can be appraised if we recall the slow progress of English structural practice during the years when it had to work with a veritable junk-pile of rolled shapes—until these were effectively simplified and modernized by the British Engineering Standards Committe.

Simplicity of the industrial raw material of engineering has a value far beyond the direct cost factor involved, as the case just cited indicates. Keeping this truth in mind, one may look forward to a broader effect of the present beam standardization than a mere reduction of some incidental costs. It is sure to lead up to further progress of the structural art, perhaps in unexpected ways.

When deep beams with wide flanges were made available to engineers, the structural art gained definitely in power, to a degree not yet fully realized in practical form. Unquestionably there are other developments in the shaping of structural material that remain to be explored and that may bring similar advance. Through the present simplification, especially when it is perfected by removal of the few surviving divergences, the way to these further possibilities is cleared of an important obstruction.

For the Use of All

"A RIVER is more than an amenity," says Justice Holmes in writing the Supreme Court's decision in the Delaware River water suit, "it is a treasure." These words, penetrating and convincing by their very simplicity, are the key to the decision rendered in that case, and are the foundation on which the water law of the future will rise up.

The opinion of the venerable jurist reflects the workings of mature wisdom and exceptionally clear insight. In but few sentences, admirable in their grasp, it sets forth the creed of equitable apportionment of use by which the rights to such waters must be governed:

> New York proposes to divert a large amount of water from . . . . tributaries of the Delaware . . . . to the watershed of the Hudson River in order to increase the water supply of the city of New York. New Jersey insists on a strict application of the rules of common law governing private riparian proprietors subject to the same sovereign power . . . . Different considerations come in when we are dealing with independent sovereigns having to regard the welfare of the whole population and when the alternative to settlement is war. In a less degree, perhaps, the same is true of the quasi-sovereignties bound together in the Union. A river is more than an amenity, it is a treasure. It offers a necessity of life that must be rationed among those who have power over it. New York has the physical power to cut off all the water within its jurisdiction. But clearly the exercise of such a power to the destruction of the interest of lower states could not be tolerated. And on the other hand equally little could New Jersey be permitted to require New York to give up its power altogether in order that the river might come down to it undiminished. Both states have real and substantial interests in the river that must be reconciled as best they may be. The different traditions and practices in different parts of the country may lead to varying results, but the effort always is to secure an equitable apportionment without quibbling over formulas.
>
> The master adopted the principle of equitable division which clearly results from the decisions of the last quarter of a century. Where that principle is established there is not much left to discuss. The removal of water to a different watershed obviously must be allowed at times unless states are to be deprived of the most beneficial use on formal grounds. In fact it has been allowed repeatedly and has been practiced by the states concerned.

Equitable use of the "treasure" of a river's waters even if it involves diversion to another watershed, thus, is established as the criterion of water law. And this is essentially new doctrine. True, the court says that this doctrine results from "the decisions of the last quarter of a century"; but all of these decisions dealt with peculiarly individual controversies, and in most or all of them the Supreme Court addressed itself to a composition of the specific controversies rather than laid down a fundamental rule, a task that it commonly avoids. Here, however, it has stated a rule, and this with utmost clearness, perhaps because the issues involved were plain and uncomplicated.

The court is to be congratulated. Its ruling will smooth the course of future discussions of water between cities and states; it opens a clear road for the advance of engineering thought and planning on matters of water; it clears away the fog of doubt emanating from the fixity of traditional views on riparian rights, and brings water law into concordance with the needs of mankind.

Industry Cooperation

MANY difficulties stand in the way of truly effective and purposeful industry cooperation through trade associations, and not least of them is the uncertain attitude of the federal government toward these essential business agencies. The fact that the government has not come forward with a clear and constructive announcement of its attitude toward associations is an important contributing factor in their present languishing condition.

Pending such announcement of policy some slight comfort can be obtained from remarks made recently by the Attorney General in speaking on anti-trust prosecutions. His remarks indicate that trade associations have a clear road ahead in doing their essential work. He said that the Department of Justice is not unfriendly to trade associations but on the contrary "thoroughly believes in them." This somewhat lukewarm statement is made more palatable by his direct assertion that no trade association activities are subject to attack except those that tend to fix prices or suppress competition.

No doubt an extreme interpretation of his words might suggest that any kind of cooperation, or even social contact of competitors, tends to affect competition; but the law can recognize only a reasonably definite influence. The work of trade associations lies quite outside the range of restraint of competition; in fact, such activities as joint research, or elimination of trade-practice diversity, do more to increase trade and competition than to restrain them. These activities can in no way be brought within the prohibited range, unless by straining them beyond the elastic limit. But in addition it is probable that some activities to which the Department of Justice has in the past objected might stand a court test, for more than half the prosecutions brought during the last two years were settled by consent decrees—and consent decrees settle nothing.

Design and Erection of a 534-Ft. Lift Span

Two articles on the new Burlington-Bristol toll bridge over the Delaware River south of Trenton, N. J., which includes the longest lift span yet built

THE TOLL BRIDGE recently completed across the Delaware River between Burlington, N. J., and Bristol, Pa., is the largest of the few private projects undertaken during 1930. Inasmuch as it is the only crossing of the river between the free bridge at Trenton and the private Tacony-Palmyra toll bridge in Philadelphia, 25 miles downstream, the Burlington-Bristol bridge occupies a strategic position. That it is a needed improvement is evidenced by the fact that the New Jersey and Pennsylvania state highway departments are spending substantial sums of money in constructing paved highways between the ends of the bridge and the existing state highways that parallel the river about 2 miles apart.

From a technical standpoint the structure is notable because of the long-lift span, 150 ft. longer than the span over the ship channel at Duluth, Minn., said to have been the longest-lift span previous to the construction of the Burlington-Bristol bridge. The method of erection, described on p. 798 of this issue, was unusual and ingenious.

—EDITOR.

Light Steel Floor Governs Long Lift-Span Design

By E. E. PAUL
Assistant Engineer, Ash-Howard-Needles & Tammen
Consulting Engineers, New York, N. Y.

THE NEW highway bridge across the Delaware River between Burlington, N. J., and Bristol, Pa., includes a lift span 533 ft. 9 in. long center to center of end bearings, which is the longest-lift span built and is believed to be the longest movable span in existence. The span is characterized by a generous use of silicon steel and a light-weight floor made up of shallow beams and checkered steel plates. This floor exerted an important influence on the design and contributed to a considerable saving in cost.

The necessity for such a long movable span was dictated by navigation requirements. The principal river navigation at present consists of tugs with long tows of gravel barges, requiring a 500-ft. clear channel and a 61-ft. vertical under-clearance. These requirements could have been satisfied with a fixed span, but it was also necessary to provide a vertical under-clearance of 135 ft. for occasional vessels and future possibilities. The solution was a single-lift span over the channel, providing an opening 540 ft. center to center of tower piers and a vertical under-clearance of 61 ft. with the span down and 135 ft. with the span raised.

As shown in Fig. 2, the bridge is 3,027 ft. long, of which 648 ft. is of earthfill between retaining walls. Approach grades of 5.35 per cent together with a slight reverse curve in the south approach and a curve 366 ft. long of 525-ft. radius in the north approach, were dictated primarily by right-of-way restrictions. The roadway width is 20 ft. between curbs, with one 4-ft. sidewalk. The toll collector's house is at the center of the lift span beneath the machinery room, in order that toll collection and span operation may be combined and that a comparatively level place be utilized for toll collection. The structure is fireproof throughout, with concrete roadway slab and sidewalk, except for a steel-plate floor on the lift span. The floor system is designed for 15-ton trucks and 15-ton trailers in each 10 ft. traffic lane.

The river piers were constructed in open steel-sheeted cofferdams. The piers are supported upon timber piles 60 to 85 ft. long, driven and jetted into compact beds of sand, clay, gravel and boulders to sustain a load of 45 tons per pile. Hollow shafts are provided for the tower piers beneath the ends of the lift span in order to reduce dead load. The piers were designed to sustain the dead and live load of the superstructure as well as a 30-lb. wind load; river ice was also a pier design consideration.

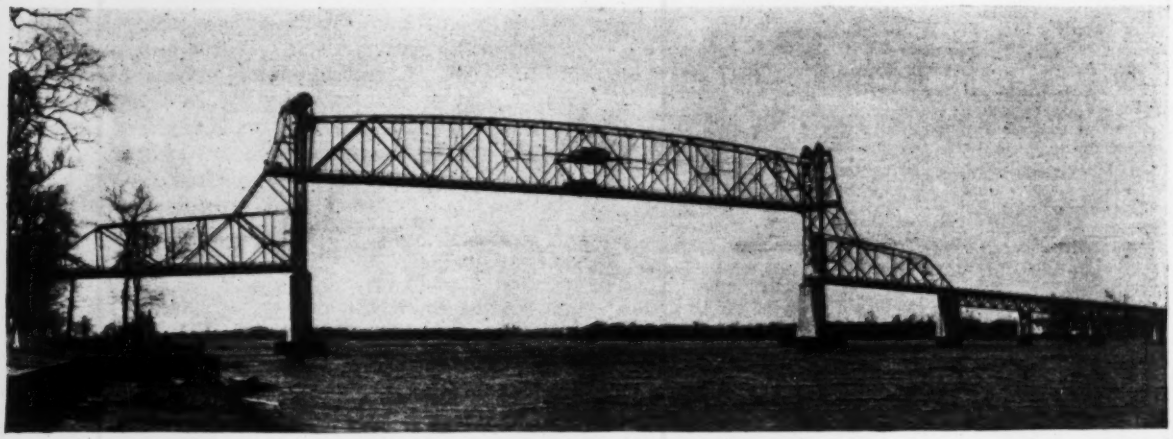


Fig. 1—Vertical clearance of 135 ft. provided by 534-ft. lift span of new Burlington-Bristol toll bridge over Delaware River

A concrete mix of 1 : 2½ : 5 was used for the main piers. River piers are protected against ice action by steel shells 14 ft. high, covering the range between extreme low water and extreme flood stage.

Approaches—For the approaches spread foundations were used, generally bearing upon sand and gravel with a maximum pressure of 1.6 tons per sq.ft. In the superstructure of the south approach one panel of longitudinal bracing is used for each three-span unit, except on the lower units, where the short columns provided sufficient stiffness in themselves. Continuity in stringers over three panels is used to assure rigidity, thus avoiding excessive bending stresses on end connections and minimizing the possibility of cracks in the concrete floor due to a tendency for the slab to take tension over the columns in attempting to act as a top flange for the stringers. Three rows of longitudinal stringers are used carrying steel cross-beams 3 ft. on centers; this layout was particularly satisfactory for the floor system around the superelevated curves.

The part of the north approach spanning a drive along the Pennsylvania shore consists of a three-span continuous-deck girder laid out on a 525-ft. radius. Stringers are eliminated to give simple framing details on the superelevated curve. The reinforced-concrete roadway slab is carried on cross-beams spaced about 5 ft. centers, supported on the continuous girders. The 14-in. H-columns of this part of the approach are supported on pins at the bottom to reduce temperature stresses. The north approach also includes four 125-ft. deck-truss spans; and a similar span flanks the tower span in the south approach.

Tower Spans—The tower spans are of conventional type, except that special attention was paid to the top chord outline of the truss, making it a continuous curve with the curve of the top chord of the lift span. A fixed connection is used at the tower end of the span, a large steel casting being utilized as a shoe for the tower columns. The truss members are connected at the lower end of the tower column in such a way as to reduce to a minimum the secondary stresses. The towers were designed to carry the vertical load of the lift span and the counterweights, and in addition 25 per cent impact from moving load. Girders are provided in the longitudinal bracing of the towers to support the counterweights in the event that it should ever become necessary to replace counterweight ropes. An unusual detail in the tower span was the use of a compressive section for the bottom chords, an expedient made necessary because of the erection method used.

Beacon lights are installed on the tops of both towers as aids to aviation, these being requested by the U. S. Department of Commerce.

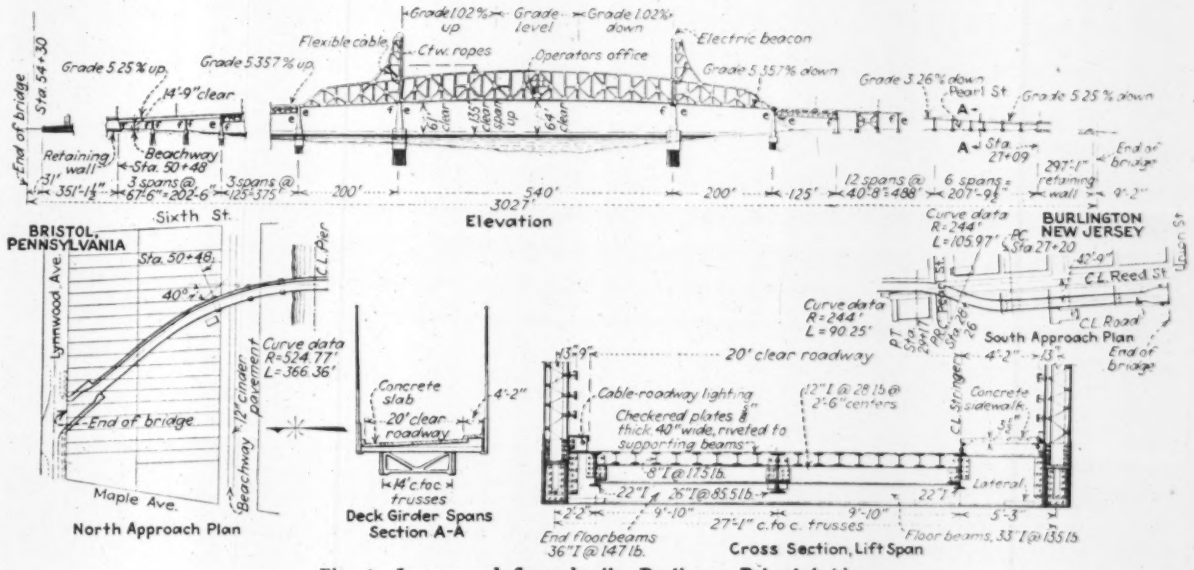


Fig. 2—Layout and floor details, Burlington-Bristol bridge

By virtue of its light weight steel-plate floor on lift span effected $40,000 saving in structure.

Lift Span—The concrete counterweights are attached to the lift span by sixteen 2-in. dia. plow-steel wire ropes passing over 12-ft. diameter cast-steel sheaves at the tops of the towers. Each counterweight weighs about 620 tons, the lift span weighing about 1,240 tons, and the total moving load being about 2,480 tons. By comparison with other large vertical-lift spans the total moving

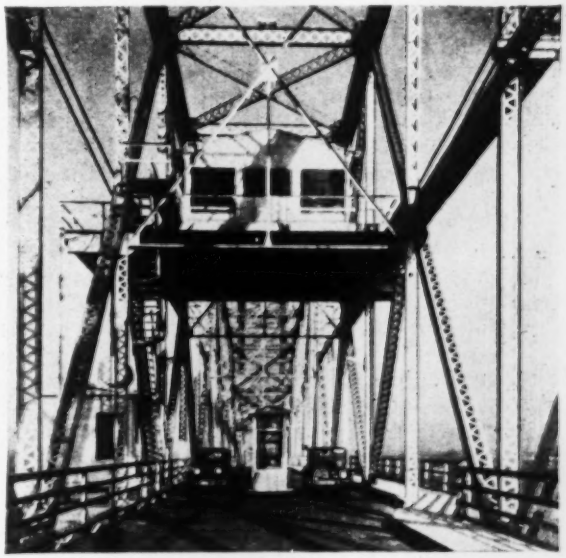


Fig. 3—Operating house and toll collection at center of lift span, Burlington-Bristol bridge

Steel work of structure is protectd by aluminum paint.

load is not exceptional, despite the great length of span.

Operation of the lift span is accomplished by two 1⅜-in. diameter plow-steel uphaul and downhaul ropes at each corner, these ropes passing over operating drums connected to the operating machinery. This machinery is of the customary type for power plants installed at the center of vertical-lift spans and is driven by two 80-hp. electric motors that raise the span 74 ft. in two minutes. A standby gas engine is capable of raising the span to its full height in seven minutes. Electric power is carried to the lift span through trolleys on the face of the tower, while control and lighting as well as telephone circuits are brought to the span through flexible cables.

Because of the great length of the lift span and the heavy loads involved it was desirable from the standpoint of economy to reduce the weight to the minimum consistent with conservative design. The weight of truss metal was reduced by a liberal use of silicon steel. The desirability of a permanent and fireproof floor for the lift span required rather exhaustive studies of the various possible types in order to combine light weight with economy. The principal types considered were treated timber with asphalt-plank surfacing, a concrete slab and deformed steel traffic plates.

The adopted floor consists of ⅝-in. deformed steel traffic plates slightly over 3 ft. wide carried on longitudinal stringers spaced about 13 in. centers; these stringers are supported by cross-beams, in turn carried on the main stringers. The floor plates are riveted to the stringers, and the rivet heads are flattened to a height of about ¼ in. No attempt was made to have the plates act as flanges for the stringers. With the arrangement used, the maximum stress on the plate occurs with moderate-weight trucks having narrow tires. Heavy trucks with wide tires will deliver a large part of their load directly to the stringers, thus producing smaller stresses in the plate. Since the plates are heavy enough to distribute some load to adjoining beams, the individual stringers are designed to carry only 80 per cent of the maximum wheel load.

Although the steel-plate floor was estimated to cost approximately $12,000 more than the next cheapest fireproof type, the light weight of the floor effected an estimated saving of $42,000 in the cost of the structure as a whole, after taking account of the effect of reduced weight upon the floor system, the trusses, the ropes, the machinery, counterweights, towers and piers. Roughly, the study showed that each pound added in the floor meant an additional cost of about 12c. in the trusses, towers, piers, etc.

One consideration in the adoption of the steel-plate floor was that of its suitability to traffic with respect to skidding or slipping. Low rates of grade were established throughout the length of the deformed-plate floor, and the initial trials under traffic indicate that it will prove satisfactory in all respects. At all roadway expansion joints, toothed steel castings are used. Aluminum paint has been used for steelwork throughout. Particular attention was given to roadway lighting.

The bridge was constructed for the Burlington-Bristol Bridge Co. Ash-Howard-Needles & Tammen were consulting engineers, for whom the writer is an assistant engineer, and C. D. Weller was resident engineer during construction. The McClintic-Marshall Co., as general contractor, employed as subcontractors Dravo Contracting Co., Pittsburgh, on piers and fenders; Yeo Construction Co., Chestnut Hill, Pa., on approach walls and fills; Hughes-Foulkrod Co., Philadelphia, on concrete floor slabs and counterweights; Zipp-Beckmeyer Construction Co., Huntington, W. Va., on electrical installations; and Earle Gear & Machine Co., Philadelphia, on lift-machinery installation.

Cantilever Erection of a 534-Ft. Lift Span

By H. G. VEEDER, JR.
McClintic-Marshall Co., Pottstown, Pa.

FROM an erection viewpoint, interest in the Burlington-Bristol bridge centered on the 534-ft. lift span. The nature of the river traffic on the Upper Delaware required that a wide clear channel be maintained at all times during construction. The methods adopted to meet this requirement were novel, particularly in their combination of cable tiebacks and cantilever principles.

The layout of the several spans in the bridge is illustrated in Fig. 2 of the preceding article. The three Pennsylvania deck spans were erected in three successive days by derrick-boat, the trusses being assembled and riveted at Fort Richmond, Philadelphia, where all steel was received for transfer to scows, and towed 15 miles to the site and erected. The six picks weighed 21 tons each, and the top chord of the highest was 58 ft. above mean water. The Pennsylvania girder spans as well as the New Jersey deck-truss span and the New Jersey viaduct were erected from the ground by tractor crane. In the case of the New Jersey deck span the substructure contractor's material-handling derrick was used to lift the outer end of the trusses.

On the tower spans work was started on the Pennsylvania end. A guy derrick standing on the end of the last deck span, using 60-ft. outrigger beams as side guys, erected this span on falsework. The guy derrick was skidded out on the span upon completion of each 50-ft. double panel. When the span was swung this guy derrick was used to set up an A-frame derrick at U-6, the top chord joint at which the back leg of the tower is connected. The A-frame was backstayed with six parts of a continuous ⅞-in. cable, three parts leading to each truss at the U-4 point of the span. From this position the A-frame rig erected the tower steel as high as it could reach. An inclined skid beam was then placed on each tower back leg and the rig jumped to its second position by sliding it up to the skid beams—46 ft. vertically and 23 ft. horizontally—where it was landed on prepared seats.

In this position the A-frame derrick erected the remaining tower sections and the 12-ft. diameter counterweight sheaves, weighing 18½ tons each with the trunnion shaft in place. The A-frame derrick rig also erected the steel skeleton framework of the 650-ton counterweights that was supported on temporary beams placed inside the tower at approximately the level of the A-frame sill. The rig was then dismantled and removed to the New Jersey tower where the work was repeated. The coun-

terweights were formed and poured in their up-position, where they remained until the lift span was ready to connect to them.

Lift-Span Erection—It was first planned to erect the lift span on falsework along the New Jersey shore downstream from the bridge site, and upon completion to float it into position, utilizing the tides. Erection plans were prepared for this method, but in the meantime an alternative scheme was studied involving a cantilever method. This second scheme was chosen on a cost comparison, influenced by the fact that the erector already possessed the $1\frac{3}{4}$-in. wire ropes necessary for temporary cable tiebacks. Moreover, the hazard involved in cantilever erection was considered to be somewhat less than that of erecting the span on falsework and floating it into place. On the other hand the method adopted required some encroachment upon the 500-ft. channel, necessitating a revision in permit to allow one bent of falsework. It was planned to locate this bent at panel point 6 on the Pennsylvania side, in which position, together with the necessary fenders, it would reduce the horizontal channel clearance to about 340 ft. during the erection period of eight weeks. Also during the last ten days of this period the vertical clearance would be limited to about 66 ft. Upon this basis the revision of permit was granted, and the cantilever scheme was carried out.

The lift span consists of twenty panels of 26 ft. $8\frac{1}{4}$ in., with panel points numbered 0 to 10 from Pennsylvania and 0 to 10 from New Jersey. At the Pennsylvania L_0 point a guy derrick set up on the pier with its mast just clearing the front tower bracing erected the main-span members from 0 to 2. This double panel was supported by four parts of $1\frac{3}{4}$-in. cable running from the U_2 point of each truss over the permanent sheaves at the top of the tower to the hip or U_2 point on the tower span, which acted as an anchor arm. Cable adjustment was provided by special 3-in. forged eyebolts. One pair of eyebolts engaged a cable beam against which the button sockets of one pair of cables had their bearing. By means of this detail the cables were easily

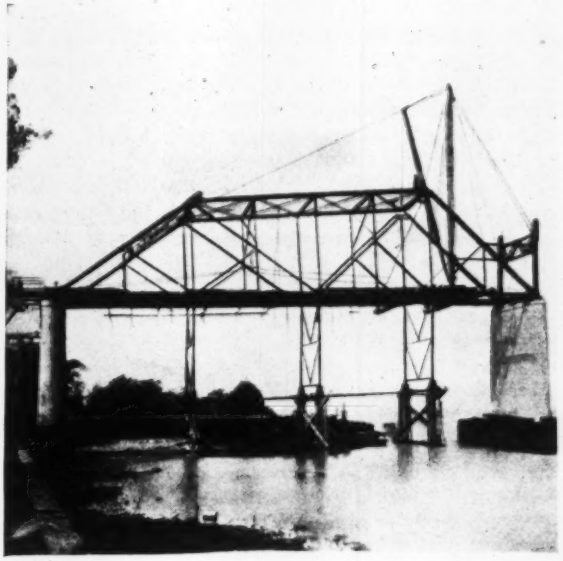


Fig. 1—Tower span erected on falsework by guy derrick

Large pin plates were placed at U_2 for the lift-span tieback connection.

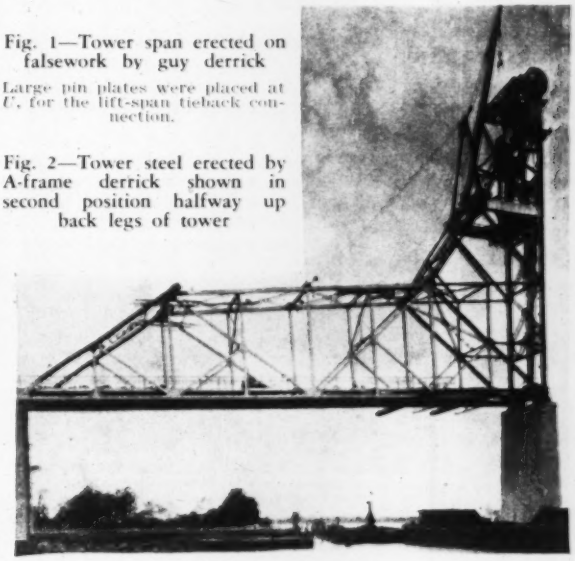


Fig. 2—Tower steel erected by A-frame derrick shown in second position halfway up back legs of tower

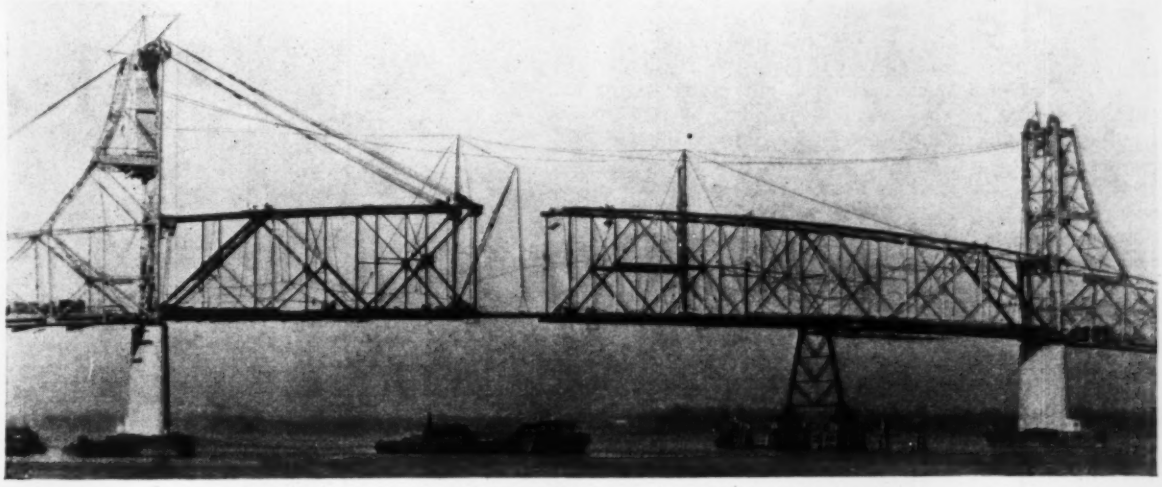


Fig. 3—Cantilever erection of lift span, Burlington-Bristol bridge

Cable tiebacks shown on New Jersey arm were also used in erecting first half of Pennsylvania arm out to falsework bent

adjusted under full load by the use of a ratchet wrench.

With the first double panel filled in, including the permanent checkered floor plate, the guy derrick moved ahead to within a few feet of L_2, and turning around, erected the top laterals behind itself. It then erected panels 2 to 4, and a second set of cables was run from U_4 back over the tower sheaves, but this time six parts of line per truss were used. The cables connected to U_2 of the left span were then slacked off, and again the derrick moved ahead to erect panel 4 to 6. In the meantime the falsework footings had been driven (32 plumb and 32 batter piles, 10 in. tip by 70 ft. long) and a steel bent erected, so that upon completion of superstructure erection to panel point 6 this much of the span was landed on the bent by slacking off the cables of U_4. The guy derrick proceeded to erect six more panels (one panel past the center) as a simple cantilever over the bent, the only difference in procedure being that the floor plate was not placed on this portion.

The New Jersey arm of the lift span was erected in a similar manner to panel point 6; but instead of landing on a bent, a third set of erection cables was installed involving twelve parts of line per truss, running from U_6 of the lift span over the tower sheaves to U_2 of the tower span. Of these twelve parts six were hooked up when the steel was erected to panel point 6, and the remaining six parts were transferred two at a time from U_4 to U_6.

At this stage only one double panel (6 to 8 on the New Jersey end) remained to be filled in. This was accomplished by erecting the members as if they were a continuation of the New Jersey arm, connecting them at panel point 6 but leaving the joints open at panel point 8.

Closure was effected by slacking the New Jersey cables to bring L_8 to a predetermined elevation. The Pennsylvania cantilever was freed of its pin at the L_0 point and then rotated about the bent at L_6 by vertical jacks working at L_0 until it matched the New Jersey arm in vertical position. A slight longitudinal shifting of the entire Pennsylvania portion toward New Jersey was accomplished by horizontal jacks at the L_0 point, the vertical jacks being on rollers. This brought all holes of the closing members into position to be pinned off.

The span was swung by a coordinated slacking of the New Jersey cables with simultaneous jacking at the Pennsylvania L_0 point. When this was accomplished the cables at U_6, New Jersey, were slack and the load was off the falsework bent, leaving the span swung on pins at the New Jersey end and on jacks at the Pennsylvania end. The permanent counterweight ropes were then hooked up and the span lowered into them by jacks, after pulling the pins at the New Jersey end. With the completion of the machinery and ropes and the placing of the floor plates, the span was ready to raise.

Some slight changes in design were required for erection by the cantilever method. A few web members were increased in section, and the verticals L_6–U_6 over the falsework bent were temporarily reinforced with a pair of 15-in. channels. Also, to take the heavy compression coming from the cantilever, the bottom chords of the tower span were altered by making a box section of the original four angles and plates, adding light side plates and lacing at the bottom.

The bridge was fabricated and erected by the McClintic-Marshall Co., Pittsburgh, Pa. Erection was under G. P. Bullard, manager of erection, Pottstown district. H. G. Veeder, Jr., was resident engineer and W. E. Omohundro foreman.

Sludge-Bed Material Spread by Machines

Sand and gravel distributed and leveled at average rate of 80 cu.yd. per hour

By NORVEL E. ANDERSON
Senior Civil Engineer, Sanitary District of Chicago

MACHINE PLACING of filter material in constructing 30 acres of sludge-drying beds for the West Side sewage treatment plant of the Chicago Sanitary District resulted in a finished surface accurate to grade, placed at an average rate of 80 cu.yd. per hour. The specially designed machine spanned the 80-ft. width of each bed and was moved forward slowly by electric power. Gravel and sand were distributed from a loading hopper to a moving belt, from which they were unloaded by adjustable scrapers and leveled by a grader blade.

The sludge-drying beds are in units 80 ft. wide and in lengths varying from 800 to 1,500 ft. The filtering material to be placed in four layers to a total depth of 14 in. was composed, from bottom to top of:

3 in. of coarse stone, ¾ to 1½ in.
3 in. of fine stone, ½ to ¾ in.
3 in. of coarse sand, No. 8 to No. 4.
5 in. of fine sand, No. 50 to No. 8.

The total amount of material was approximately 60,000 cu.yd. The top surface was required to be finished accurately to grade. The difficulties of handling the material were increased by the facts that the sludge-drying beds have no bottom other than the natural clay carefully prepared by grading and rolling and that the underdrains extend across the beds at 18.5-ft. intervals, making it practically impossible to use any kind of machine traveling inside the beds without damaging the

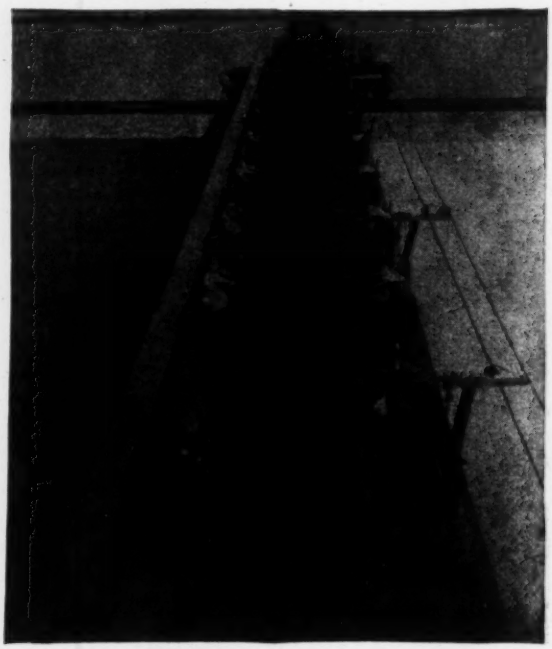


Fig. 1—Moving belt distributes filter material
Adjustable scrapers deflect sand or gravel from belt to distributing trough.

subgrade and drains. However, as the beds are designed for mechanical cleaning and have for that purpose 90-lb. rails the full length of the walls and a standard-gage railroad track along the sides for the full length of each bed, it was possible by using these features to develop a satisfactory method of handling the material.

After considering many types of standard and special equipment, the machine shown in Fig. 2 was designed and built. It consists essentially of a self-propelled bridge spanning the full width of the bed, 8 ft. 6 in. c. to c. of rails, carrying a loading hopper at one end, a belt conveyor with plows for unloading the belt uniformly along its length, and an adjustable screed for leveling the material in place. The bridge is a box truss made up of light structural angles. It is 5 ft. deep and 5 ft. between trusses, and carried on two 12-in. double-flanged wheels at each end. Power is supplied by a 5-hp. reversible electric motor, mounted at the center of the span and connected through reduction gears and squaring shaft to the end trucks. Each of the four wheels is driven by chains and sprockets from the squaring shaft. It was found necessary to add a load of pig iron over the drive wheels in order to develop sufficient traction to prevent slipping.

The greatest problem encountered was to unload the belt uniformly across the bed. It could have been accomplished by the use of a standard tripper, but this would have made the machine too heavy to transfer economically from one bed to the next. The answer was a 24-in. flat belt, carried on a maple table instead of idlers, with adjustable steel plows or deflectors placed at regular intervals along the belt and set so that each succeeding plow projected progressively nearer the center. As a further aid in distribution, light sheet-steel baffles were bolted to the framework under the points of discharge from the plows. The belt was driven by a 15-hp. gasoline engine mounted on the end of the bridge opposite the loading hopper. The loading hopper was made 7 by 9 ft. at the top to provide for charging with a clamshell bucket, and discharged onto the belt through an adjustable slide gate.

Leveling of the material was accomplished by means of an adjustable screed suspended below the bridge. The screed consisted of steel plates reinforced with angles, with one edge hinged to the bottom chord of the rear truss and the other edge suspended by adjustable hangers from the forward truss, making the forward or striking edge adjustable for height. Since material was plowed off of both sides of the belt simultaneously, the screed served the additional purpose of deflecting forward the material from the rear side of the belt.

In operation the filtering material was transferred from railway cars to the loading hopper by a locomotive crane with a 1½-yd. clamshell bucket, cars being switched to the crane by an industrial locomotive. The machine operator's position was just behind the loading hopper. From this point the flow of material onto the belt was regulated, the machine travel controlled by push buttons, and the belt was started or stopped by cords attached to the clutch. Due to the practical impossibility of maintaining uniform mechanical distribution of material, it was found desirable to have one or two men on the catwalk along the belt for adjusting plows and otherwise assisting distribution, and three men in front of the machine to see that there was a uniform supply of material in front of the leveling edge.

In transferring the machine from one sludge bed to another it was necessary to reverse the ends so that the loading hopper would again be adjacent to the railroad track. This transfer was made by the use of two cranes, the locomotive crane and a crawler crane that was used on other parts of the work. One crane remained practically stationary, holding its end of the load, while the other crane carried the opposite end of the machine around an arc of 180 deg.

The rate of handling material was governed largely by the locomotive crane. The spreading machine had a working speed of a little more than 3 ft. per minute, but frequent stops were necessary. The maximum day's run was 31 cars of sand, or about 1,250 cu.yd. in twelve hours, while an average for all grades of material, allowing for delays, was about 80 cu.yd. per hour. The plowing-off of crushed stone proved very damaging to the conveying belt. Two high-grade rubber belts were worn out on the job, each belt being used on both sides. The machine proved not only an economical device for placing the material but made a finished job much superior to that which would have resulted from hand leveling.

The general design of this machine was made by T. L. Warner of the Warner Construction Co., the contractor for the sludge beds, and the author, who represented the sanitary district on the work. The detailed design and fabrication was made by H. W. Caldwell & Son Co.

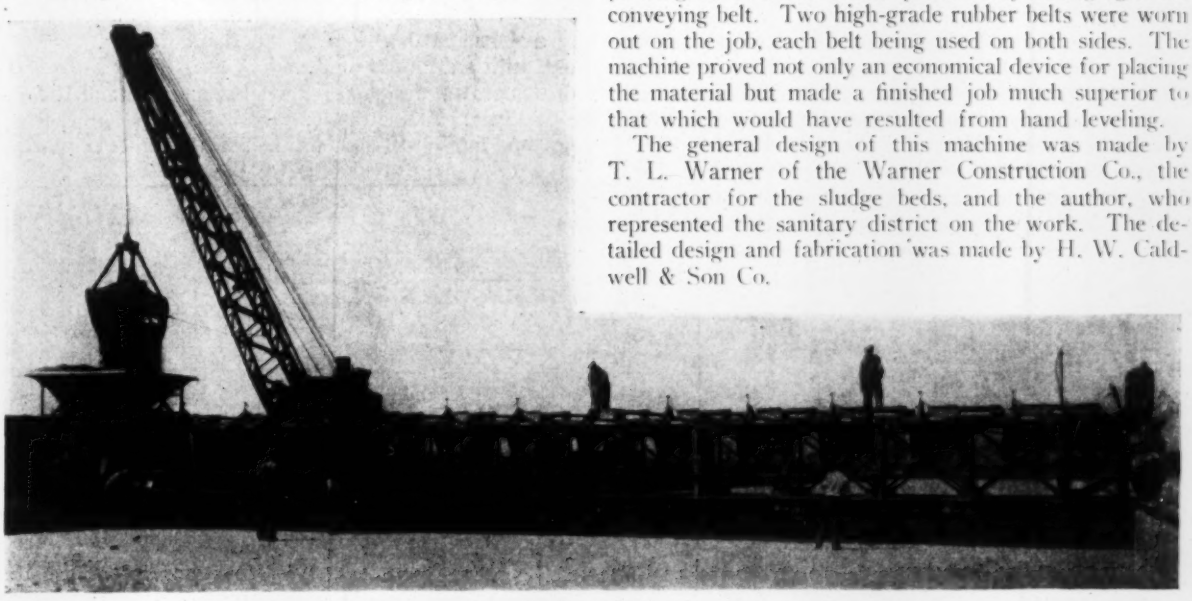


Fig. 2—Motor-propelled distributing gantry for sludge-drying beds

Filter material transferred from cars to hopper at left by clamshell bucket. Maving belt distributes sand and gravel over width of bed. Steel screed at bed surface levels material to desired grade.

Express Terminal at Chicago for C.&N.W. Railway

Building and car yard to relieve passenger station of express business — Ramps to upper floors

TO FACILITATE the handling of its extensive express business, the Chicago & Northwestern Railway has under construction at Chicago one of the largest express terminals in the country, including a large three- and four-story building with interior tracks and a storage and repair yard for express cars. This terminal, near the passenger terminal, will eliminate most of the handling of express matter at the passenger station and thus reduce the time of holding trains on the station tracks during busy periods.

With the new terminal in service the express cars of inbound trains can be switched to it when the empty trains are backed out to the coach yard, while cars loaded at this terminal can be switched quickly to the head ends of outbound trains standing in the passenger station, as is done now to some extent with mail cars. It is estimated that in this way consignees may receive their goods an hour earlier than at present, while shippers can deliver goods for specific trains at the terminal an hour later than at present. While the terminal will be operated by the Railway Express Agency mainly for the Chicago & Northwestern Railway business, it will serve also for general express purposes, some of the local express offices being closed and their business concentrated at the terminal.

This new terminal, which is parallel with the four-track main line to Omaha, includes the station and yard, the latter having five stub tracks with a total capacity of twenty cars, as shown in Fig. 1. It is served by a lead track 3,000 ft. long, which is outside the building and is connected to the main line at each end. In the building are three tracks, all connected at both ends with the lead track. An island platform is arranged between the first two tracks, while the third is served from the main floor or platform. Each platform track will hold twelve cars. The total length of platform tracks, yard tracks and lead track is about 10,000 ft. As the railway is about 20 ft. above the street level, the widening for additional tracks necessitated the widening of fourteen steel bridges over streets and alleys.

The terminal building (Fig. 2), of steel-frame construction, is 235 ft. wide, with a length of 500 ft. on the track side and 730 ft. on Kinzie St., as the east end fronts on the diagonal line of Milwaukee Ave. A street has to be carried through the first floor of the building. This floor will be used mainly for the storage and servicing of about 275 motor trucks. The second floor will have a 25-ft. driveway around it and will serve as a central sorting platform, while the third floor is at platform level. These two floors, connected by elevators, are served by ramps from Milwaukee Ave. and Halsted St. After passing under the railway these two streets rise on grades of about 2½ per cent to viaducts crossing an adjacent group of tracks at street level, so that driveway ramps of easy grade lead from both streets directly to the third floor.

Column foundations consist mainly of 4-ft. concrete piers built in open wells and sunk to hardpan at an average depth of 65 ft. below datum (Chicago River), being belled at the bottom to such size as to limit the load on hardpan to 16,000 lb. per square foot. Columns are of H-section beams, in panels approximately 26x 29½ ft. Floor framing consists of transverse lines of heavy I-beams, with lighter longitudinal I-beams framed between them. These latter beams are spaced normally 4 ft. 3 in. c. to c., but where the driveways extend over Union St. the beams are spaced about 21 in. c. to c. Girders of 41½-ft. span are used at certain points where columns are omitted. Long steel trusses carry the roof over the platform, thus giving a large space unobstructed by columns. Girders carry the roof over the tracks. Reinforced concrete for the floors and platforms is extended to inclose the steel beams, and the upper driveways have a 4-in. concrete wearing surface. Lightweight concrete tile made with a light weight coarse aggregate is used for the roof and is covered with four-ply built-up roofing. Longitudinal skylights are arranged over the platforms and over each track is a continuous 3-ft. opening or smoke slot having 9-ft. sides extending above and below the roof.

Live load for the driveways is taken as two 24-ton trucks in tandem, with 10-ft. wheelbase and 10 ft. apart, having axle loads of 12 tons. For the tailboard space the assumed loading is a 15-ton truck of 15-ft. wheelbase, with axle loads of 3 and 12 tons. Platforms and office floors are designed for live loads of 200 and 100 lb. respectively. At the east end the building is four stories high, and the fourth floor will be used for office purposes.

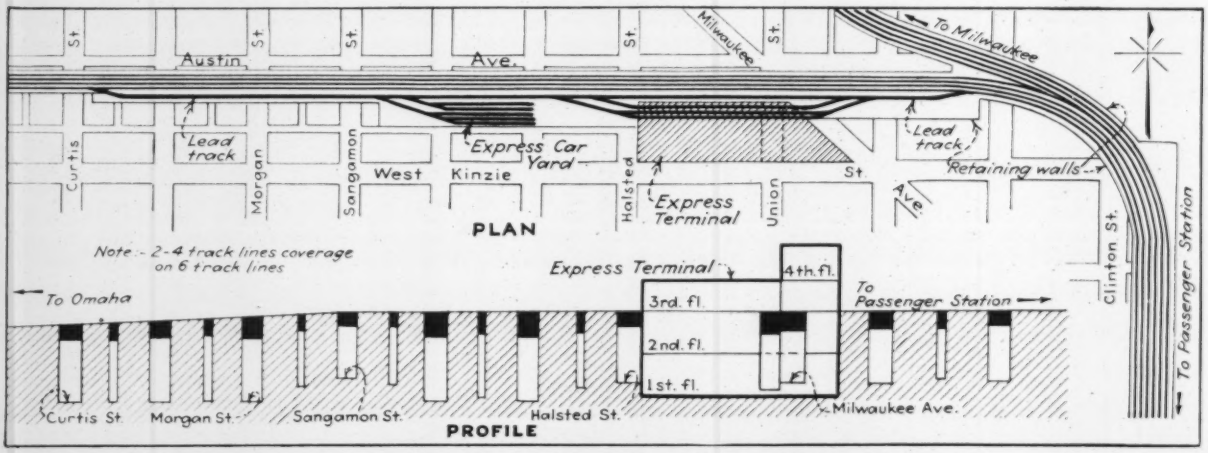


Fig. 1—Chicago express terminal, C.&N.W. Railway

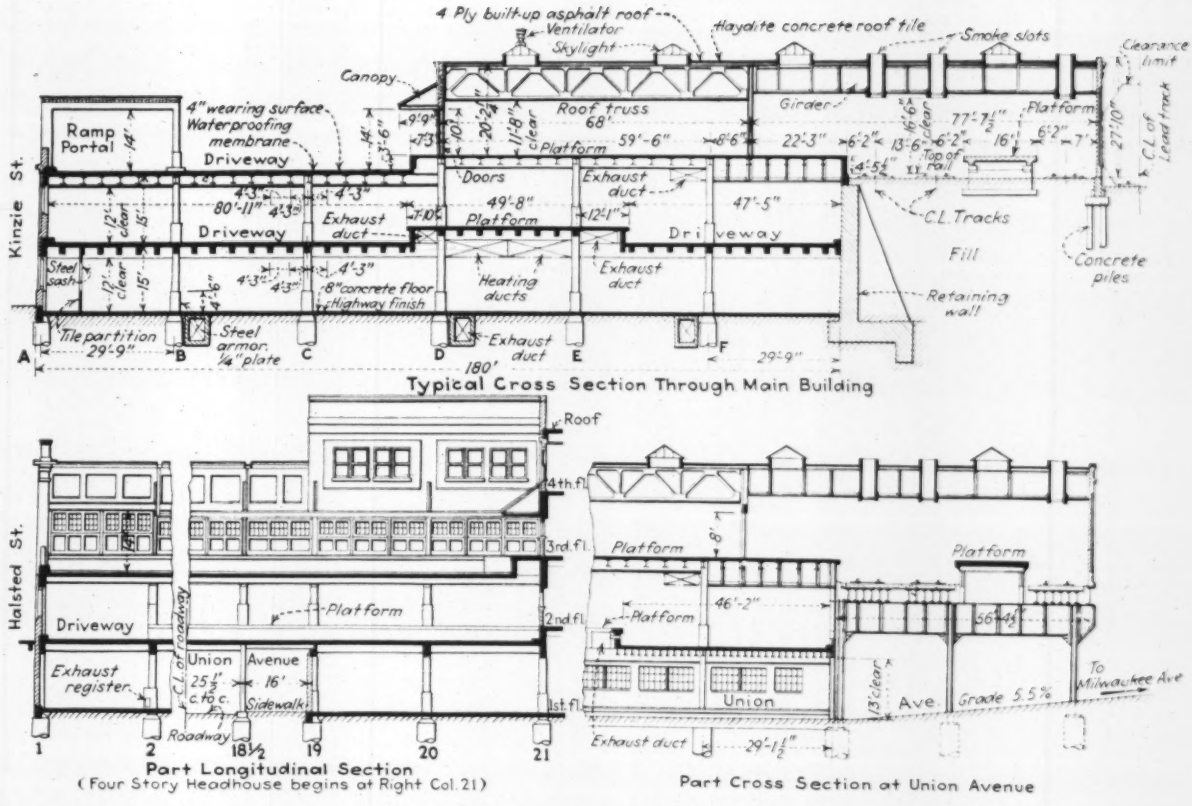


Fig. 2—Express terminal station with elevated tracks

Special facilities will include cold storage, refrigerating plant, ice plant and a warm room kept at uniform temperature for storing perishable goods in cold weather.

This express terminal was designed under the direction of the late Walter J. Towne, chief engineer of the Chicago & Northwestern Railway, and the work is being carried out under Chester T. Dike, the present chief engineer. The general contractors are Anderson & Co. for building work; the M. E. White Co. for foundations, retaining walls and bridge abutments; and the American Bridge Co. for structural steel. The total cost is estimated at $4,000,000.

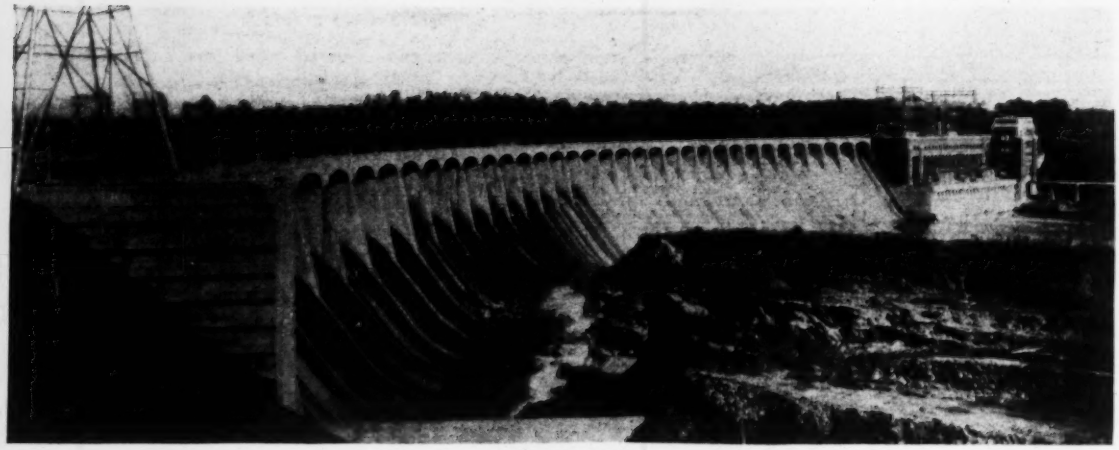
Regional Planning Progress in Philadelphia Tri-State District

A PLAN for the region of Philadelphia comprising the Tri-State District is 80 per cent complete and fast coming to the point of completion. William H. Connell, executive director, in a report to the recent annual meeting stated that the technical plan would embrace the following phases of the problem: (1) an indication of the probable distribution of population; (2) a suggested system of major and secondary highways, boulevards, parkways and bridges; (3) a suggested system of parks, other public reservations and connecting parkways; (4) a study of railway passenger and freight transportation facilities; (5) a study of waterways and ports; (6) a study of sanitation, drainage and water-supply facilities; (7) a suggested system of airways and landing fields.

In April, 1930, a "tentative preliminary plan," which is a diagrammatic scheme containing 300 planning proposals of major highways, parkways, parks and forest areas for the outer region, was sent to each of the 200 members of a technical advisory committee for suggestions. More than 125 members of the committee have submitted planning suggestions. Three or four meetings per week are held of interested groups to educate and iron out controversial features. Ultimately, a comprehensive plan committee will coordinate all proposals and hold meetings with the 200 technical advisers in the hope of reaching an agreement on the plan for the 4,500 square miles in the region. The make-up of the advisory committee, 140 chief engineering officials and the remainder architects, landscape architects and consulting engineers, is considered the key to the harmonious accord with the final plan, since in effect the plan is being formulated jointly by the local officials. To sell the plan, 150 meetings have been held in the region and 44 at headquarters. Five special park organizations have been formed to cooperate with the Regional Planning Federation. The officers, members of committees and field secretaries are constantly presenting the reasons underlying the planning proposals as they affect the different committees.

Financially, 97 per cent of the amount pledged has been collected, and the organization has been operated well within budget allotment.

A few points of interest so far developed are as follows: The present 3,530,000 population of the region will be 5,900,000 by 1970, and liberal provision must be made for the continuous social and economic living conditions by that time. A suggested belt line and industrial highways have been agreed to in principle by highway officials of four states, with Pennsylvania making a survey to fix right-of-way. Where the highway passed through a residential area it is proposed to make a parkway to preserve the character of the district.



Jordan Dam on the Coosa River in Alabama

Cofferdams and Stream Control at Jordan Dam, Alabama

Building crib dams 40 ft. high—Sealing construction joints—Closure methods for stream-control openings

By LEE WARREN
Superintendent, Phoenix Utility Company, Hot Springs, Ark.

THE construction problems of the Jordan dam, except for those common to every large isolated operation (heavy equipment and extensive camp, shop, transportation and materials supply provisions), centered in the devices for river control, including cofferdam building and closure proceedings in the weir portions of the structure. In general, the order of construction was: (1) spillway bays 1 to 16; (2) spillway bays 17 to 30; (3) lock, approach canal, west abutment and headworks, east abutment and east core-wall; and (6) main substation. Referring to the general plan, Fig. 2, it will be seen that the arrangement of work was based on using two cofferdam closures.

General Closure Procedure

The records of flow of the Coosa River show an average of 17,000 sec.-ft., a maximum of 210,000 sec.-ft. and a minimum of 1,600 sec.-ft. Roughly, half the river at a time was closed by a cofferdam (Fig. 1). Cofferdam 1 included the excavating and concreting for the gate and overflow spillway west of spillway pier 30, which is the east limit of bay 30. Cofferdam 2 included the open spillway east of pier 30 and also the power-house headworks and tailrace.

Water was passed around the east end of cofferdam 1 while it was still in service and during the early stages of construction of cofferdam 2. Eleven stream-control openings, each 30 ft. wide, were provided. These were in cofferdam 1 area, in the overflow section of the spillway for passing the flow of the river during the later stages of construction of cofferdam 2 and during the period of service of this cofferdam. These openings lay between piers 18 and 29. The five openings in the even-numbered bays were all poured to El. 195. The six odd-numbered openings were poured to pre-arranged elevations considerably lower than 195, determined by streamflow and control calculations. All of these stream-control openings were separated by 10-ft. concrete piers that served as derrick supports. These piers later became integral parts of the permanent structure.

In addition to these eleven openings, two openings (each 30 ft. wide) were provided in cofferdam 2 area, and in bays 31 and 33, Fig. 2. These openings, with a floor elevation of 195, did not carry any streamflow until cofferdam 2 was dismantled and final closure operations were started. The first of the two final operations for

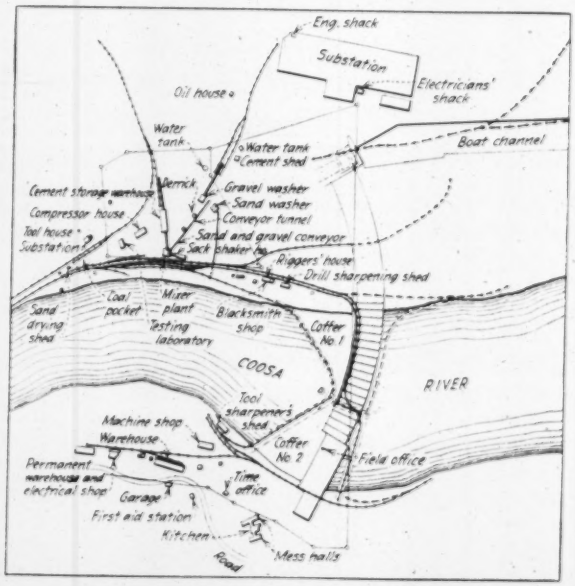


Fig. 1—Plan of cofferdams and plant layout

river closure was to complete the concrete in the five even-numbered openings from El. 195 to crest El. 283. The second was to complete the concrete in the remaining eight odd-numbered openings to crest El. 283. A total flow of 10,500 cu.ft. per second was estimated for the six stream-control openings in the group of eight odd-numbered openings during the closure operations.

Cofferdam Construction

One of the unusual features of construction, cofferdam 1 (Fig. 6), which was started in the low-water period was the longitudinal concrete footings. These were poured on the river bottom for a length of 255 ft., starting at the west shore; their purpose was to secure a watertight seal with the wood sheathing on the upstream face and to anchor the cribs on both downstream and upstream faces.

After the timber cribs were built and filled with stone the wood sheathing was added. The bottom of the sheathing was fitted tightly and nailed against a 3x10-in. wood nailing strip in the tops of the concrete footings. The upstream edges of the cribs were braced against water pressure on the upstream face by heavy timbers on 5-in. centers, bolted into the cribs at the upstream face, and with the downstream end braced against the upstream face of the downstream footing. As a final operation the clay fill was added to the upstream face of the sheathing. Later tests under high-water conditions proved this concrete seal to be very effective. Leakage under the sheathing was negligible. The elevation and plan of cofferdam 1 were based upon estimates that the remaining clear section of the river-bed would pass 38,560 sec.-ft. before cofferdam 1 would be overtopped and flooded.

Cofferdam 2 (Figs. 5 and 7) consisted of two arms of rock-filled cribs, upstream and downstream, and an outstream arm of reinforced-concrete walls built near the east edge of spillway bay 30 and parallel to this edge.

Concreting Procedure

Concrete was mixed in two 4-cu.yd. mixers, electrically driven and located in a central plant. The mixers dumped directly into steel buckets or hoppers, resting upon flat cars on railroad tracks reaching to various parts of the work, as shown by Fig. 1.

Where forms were not complicated and narrow and in large-volume pours, 4-cu.yd. bottom-dump buckets were used; 2-cu.yd. bottom-dump buckets were used in small volume pours and in narrow and complicated forms. There were also three 2-cu.yd. and two 8-cu.yd. steel hoppers, arranged with lever-operated gates and bails that were hauled on flat cars. These were often utilized when high reaches of derricks were necessary. Without moving from the cars they were frequently emptied by chutes, arranged to receive the concrete from the hopper gate spout and to deliver it directly into forms. These large hoppers were installed often on platforms with chutes leading from them to the forms. Then the 2-cu.yd. buckets were handled by der-

Synopsis of Structural Features

Jordan dam is located on the Coosa River in Alabama, about 20 miles northeast of Montgomery and 70 miles south of Birmingham. It was constructed by the Dixie Construction Co. for the Alabama Power Co. Preliminary construction was begun in June, 1926, and excavation for the permanent structures in November, 1926. The first generator was placed in service Aug. 31, 1928, and the fourth and last Nov. 13, 1928. All parts of the plant were completed in January, 1929. The total capacity of the plant is 144,000 hp., with four 30,000-hp. generators and provision for two additional generators.

The plant structures are shown by Figs. 1 to 4. Their total length along the upstream side is 2,066 ft. They consist of abutments with corewalls extending into the banks, the power house headworks and power house, the navigation lock, and the dam structure proper, built on an arc of 1,700-ft. radius and 1,405 ft. long in two divisions—the gate division, 600 ft. long with seventeen gates, 18 ft. high (Fig. 3), and the overflow division, 724 ft. long (Fig. 4). Both divisions have piers carrying a concrete deck. The power-house headwall is 420 ft. long with a maximum width of 47 ft. 2 in. and a maximum height of 125 ft. It contains four sets of reinforced-concrete penstocks with three tubes each and intakes at El. 195 and two additional sets for future units with intakes at El. 241.

The power house is 300x62 ft. It is of structural steel and concrete. The turbines are Francis, 36,700 hp., 19 ft. 9¼ in. in diameter, 28½-in. shaft, 90-ft. effective head and weighing, runner 112,000 lb., shaft 60,000 lb. The generators are 29,000 kva. at 0.862 power factor. The power house has a full equipment of cranes and control apparatus.

The reservoir formed by the dam has an area of 4,900 acres and a shore line of 125 miles at El. 283. The maximum depth at the dam face is 103 ft. The drawdown is 10 ft.

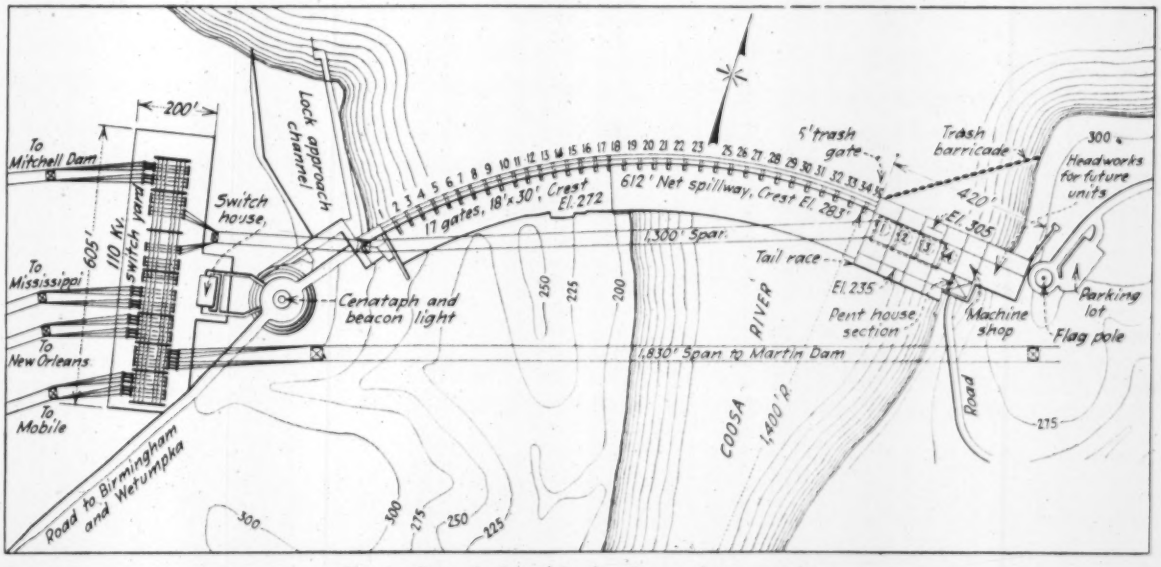


Fig. 2—General plan of Jordan Dam and power units

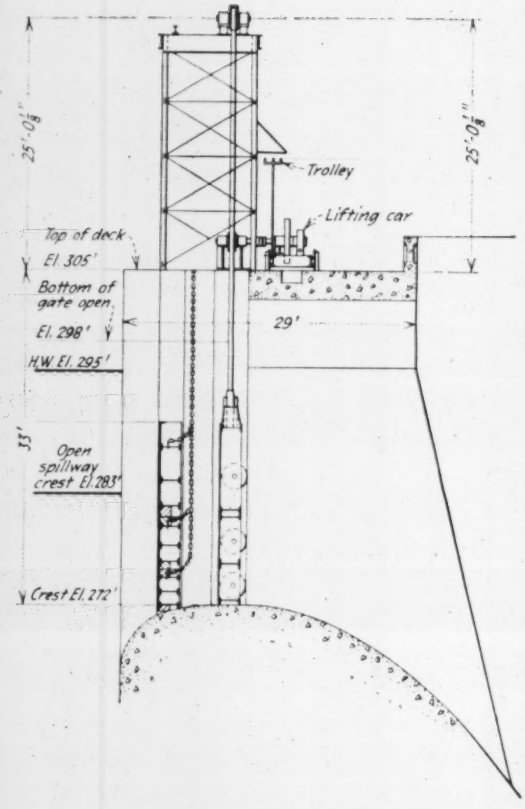


Fig. 3—Gate section of Jordan Dam

ricks from cars to the 4-cu.yd. hopper and dumped into it.

The gate spillway was poured in alternate blocks of 42- and 30-ft. width; the overflow spillway was poured in alternate blocks of 50- and 30-ft. width. Keyways in the ends of the blocks first poured were coated with hot asphaltum to permit temperature movements. In the spillway, except in the stream-control openings, concrete was poured on a 10 per cent slope, the low end being at the upstream face; keyways on joints between pours were omitted but were placed in vertical faces. In the stream-control openings concrete was poured in horizontal layers with keyways 1 ft. deep, 4 ft. wide at the bottom and 5 ft. wide at the top.

Concrete Joint Construction in Power House

The power house and headworks were concreted in 22 stages or pours, with definite lines and elevations. A unit of the power house and headworks is 60 ft. wide, and concrete was poured in blocks 60 ft. wide with contraction joints. These pours were also sloped 10 per cent, the low end being at the upstream face. At a point 5½ ft. downstream from the upstream face of the headworks a water stop or seal was formed at the joint between each unit as follows: A 24-in. shaft was formed, extending from the rock foundation to the top of the headworks deck. In the center of the shaft a 2-in. diameter steel pipe was placed, with its bottom plugged and top open, extending the full height of the shaft. A ¾-in. pipe was placed inside the 2-in. pipe. Hot pitch was poured, in stage heights, into the 24-in. shaft and around the 2-in. pipe. When the headwork deck was finished steam was conducted from a boiler to the ¾-in. pipe having an open bottom; the steam heated the 2-in. pipe, and this heated the surrounding pitch, which became homogeneous; the small settlement at the top was refilled with hot pitch. The heating operation was continued until settlement in the pitch ceased; then both pipes were capped. If the pitch settles in the future, the heating operation can be repeated.

In addition, asphaltum-painted steel plates, 5/16 in. thick and 18 in. wide, one-half width greased, were placed vertically across the contraction joints of 60-ft. centers in the downstream wall of the bus vault; they extended from a point 1 ft. below the bus-room floor to 21 ft. above it. Also, similar plates were installed on the 10 per cent slope across the vertical contraction joints, starting at El. 190 at the downstream end, which was under the downstream face of the south wall of the bus vault, and extending upstream a distance of 42 ft. These plates were intended primarily to prevent leakage from vertical contraction joints from reaching the bus vault.

When the penstocks and scroll cases were completed all construction joints in them were raked out and filled with a plastic paste of five parts of a bituminous compound and one part cement, then the entire interior surface of these sections was coated with a bituminous solution, applied with a compressed-air painting gun. This application formed a plastic coating. Prior to filling the reservoir the vertical contraction joints in the headworks at the upstream end were raked out and filled with this same material; then the entire upstream face of headworks, including penstock piers upstream from gates, was covered with one application of the paint.

After several weeks' operation of the turbines one unit scroll case and penstock were drained. The waterproofing was found to be in a plastic condition, and the bond was firm.

Closure of Stream-Control Openings

The first step in the closure operations was to pour all 50-ft. blocks in the open spillway up to crest El. 283.

Placing the concrete in the eight 30-ft. stream-control openings (the river closure operation) was one of the outstanding features of the project. Careful preliminary plans were prepared in the headquarters and field offices. All methods, equipment and procedure were outlined and scheduled weeks in advance of the first concrete pouring. Each opening and every pour was numbered, the latter for sequence of operations. The stream-control openings were scheduled and poured in pairs. Two openings were

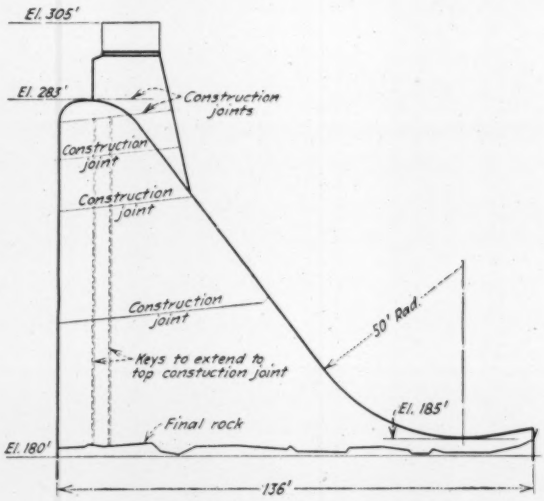


Fig. 4—Overflow section of Jordan Dam

always poured to the same elevation. A difference of 2 ft. in elevation was allowed between adjacent pours. Therefore, when a stage in a pair of openings has been poured, the difference in elevation between the highest and lowest pairs was 6 ft. It was originally planned to carry the river always through six openings, while the other two would be blocked during concreting. However, due to favorable weather and river conditions as high as six openings were blocked simultaneously, taking the flow of the river through two openings. However, this was not a normal condition. An average of four openings was blocked simultaneously.

The main equipment and apparatus were: eight spillway permanent steel gates, 32 ft. wide and 18 ft. high, for upstream caisson and concrete form, one per opening; a movable wood truss for raising and lowering these gates; a steel flat car, standard gage, counterweighted and provided with I-beam outriggers for strutting and transporting the truss and equipped with one 80-hp. motor-driven hoisting engine for handling the gates; movable wood caissons and stop-logs for blocking the downstream end of the openings during the first few pours; special curved forms for the downstream face; special straight forms, one piece 32 ft. wide and 10 ft. high, for the downstream face above the curve; a group of motor-driven centrifugal pumps and duplex air pumps. Seven 20-ton steel derricks spaced 77 ft. on centers, at El. 240, on wood bents on the downstream face

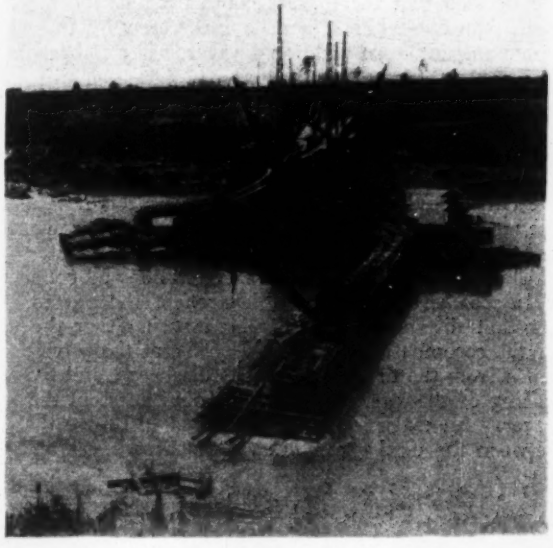


Fig. 5—Construction of cofferdam No. 2

of the spillway handled the wood caissons, forms, concrete, etc.

Vertical steel channels were embedded in the concrete in the upstream faces of adjacent blocks (two per block) to serve as sealing strips for the steel-gate caissons. The gates were lined on the downstream sides with 2-in. lagging to serve as concrete form. The other, or water side, presented the steel-plate surface. These caissons were raised and lowered by cables passing over the wood truss to the two-drum 80-hp. hoisting engine on the flat car on the deck. When the caissons were lowered to "closed" position, or when raised and inactive, they were suspended from cables passing over the crest of the two

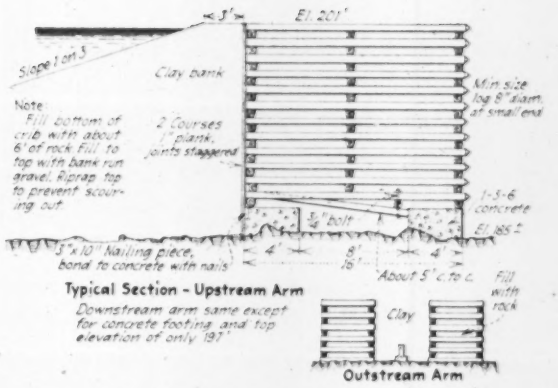

3'
El. 201'
Slope 1 on 3
Clay bank
Min. size log 8" diam. at small end
Note: Fill bottom of crib with about 6' of rock. Fill to top with bank run gravel. Riprap top to prevent scouring out
2 Courses 1" plank, joints staggered
1-3-6 concrete
3/4" bolt
El. 185 ±
5"x10" nailing piece, bond to concrete with nails
4'
8'
16'
4'
About 5' c to c.
Fill with rock
Typical Section - Upstream Arm
Downstream arm same except for concrete footing and top elevation of only 197'
Clay
Outstream Arm

Fig. 6—Sections of cofferdam No. 1

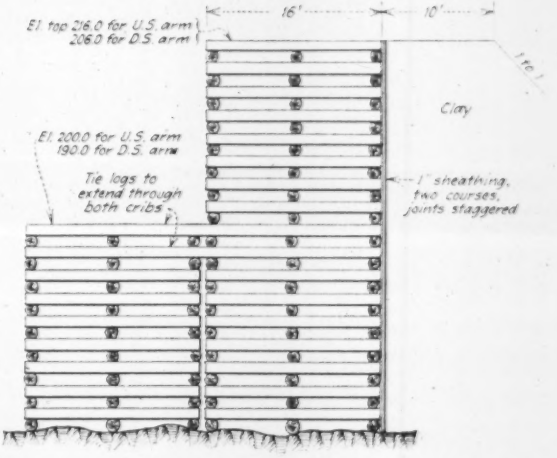

El. top 216.0 for U.S. arm 206.0 for D.S. arm
16'
10'
1:0.7
Clay
El. 200.0 for U.S. arm 190.0 for D.S. arm
Tie logs to extend through both cribs
1" sheathing, two courses, joints staggered

Fig. 7—Section of cofferdam No. 2

adjacent bays; they were then disconnected from the hoisting table.

The wood truss was supported on piers on the crest of the two adjacent bays. When it was carrying the load of the gate it was strutted by the I-beam outriggers on the steel flat car. When moving from opening to opening the same outriggers carried the truss, the flat car being moved on track on the spillway bridge by locomotive or crane.

The downstream wood forms 10x32 ft. were handled by the derricks. One of these forms was provided for each of the eight openings. Caissons were provided for the first few pours in the openings, two sets being fabricated. After the derricks placed them in position, one on each side of the opening, they were filled with clay which sealed them against the concrete apron of the adjacent bays. Then two sets of 10x10-in. timber stop-logs, 40 ft. long and 13 ft. high, were placed between the two caissons, one at the downstream end and one 4 ft. upstream from the first bulkhead, forming a 4x40x13-ft. chamber; this was filled with clay for sealing. This assembly formed a cofferdam around the downstream end of the opening.

The sequence of operations was: (1) lowering the upstream caisson and sealing it; (2) installing the downstream caisson and clay; (3) placing the pumps and dewatering the inclosure; (4) placing the downstream form; (5) placing concrete; (6) removing the downstream caisson; (7) removing the upstream caisson.

After the first four pours had been made, use of the downstream clay-filled caissons was discontinued, the

bottom elevation of all succeeding pours being above tailwater level. It was also unnecessary to use pumps for unwatering the openings, the water draining out of itself at the downstream end as soon as the upstream caisson was lowered and sealed.

The sequence of operations after the first six pours was: (1) lowering the upstream caisson and sealing it; (2) placing the 2-in. pipe drains and 6x6-in. box drains; (3) placing the downstream form; (4) placing concrete; (5) removing the downstream caisson; (6) grouting the drain pipes and box drain; (7) removing the upstream caisson.

Personnel

The engineering department of the Alabama Power Co., in Birmingham, designed the permanent structures, supervised by O. G. Thurlow, vice-president in charge of engineering, with J. A. Sirnit, designing engineer, and F. E. Hale assistant designing engineer. S. H. Woodard is consulting engineer for the Alabama Power Co. The construction was carried on under the supervision and direct control of A. C. Polk, construction manager and vice-president, Dixie Construction Co. The construction plant layout was made by C. D. Riddle. M. E. James was chief inspector. C. C. Davis was general superintendent until Oct. 1, 1928, when he was relieved to take charge of another project. The writer was assistant superintendent in charge of engineering and first assistant on construction. He succeeded Mr. Davis as general superintendent. K. V. Jones was principal assistant engineer, and F. S. Smith was assistant superintendent in charge of labor and mechanical forces.

Tandem Pavers Mix 74 One-Minute Batches an Hour

By EMORY D. ROBERTS
Head of Department of Civil Engineering, Marquette University, Milwaukee, Wis.

USING two pavers hitched tandem, an hourly output of 189.2 ft. of 20-ft. 9-6-9-in. concrete pavement was maintained for five hours on Oct. 3, 1930, on a road contract in northern Illinois. The tandem arrangement used was devised by Jaicks Brothers Construction Co., Chicago, Ill. The work was done under the exacting specifications of the state of Illinois, which require that the concrete be mixed for 60 seconds after all materials, including water, are in the drum of the paver. The specifications also restrict the size of the batch to 10 per cent above the rated capacity of the paver, in this case 29.7 cu.ft.

Records Stated

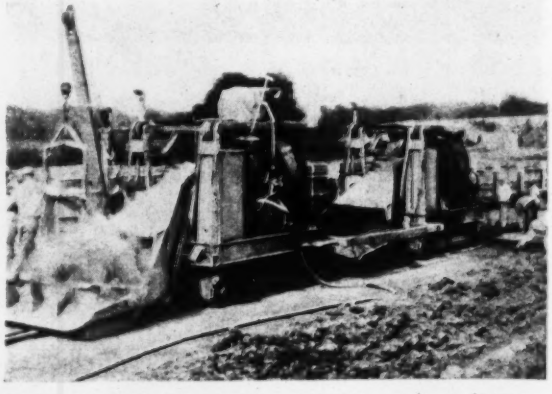
To establish a sustained production of 378.4 sq.yd. of standard paving per hour for five hours, 369 batches of concrete were handled through the paver at the rate of 74 batches per hour, or a mixing cycle of 48.6 seconds, with the mixing time set at one minute. This was accomplished by placing two pavers in tandem, assembling the materials and water in the first paver for a mix of 28 sec., discharging the partly mixed concrete into the skip of a second paver, which mixes the batch for the remaining 32 sec. of the prescribed time, and discharging the concrete into the boom bucket for distribution to the grade. At times 80 batches an hour have been produced.

Besides these peak records an abnormal production for a regular paving crew was obtained for the last five days of the contract. On Sept. 29 the contractor laid 1,937 lin.ft., or 3,874 sq.yd. The next day 1,710 lin.ft., or 3,420 sq.yd., was laid. A two-hour delay while crossing a railroad reduced the output for Oct. 1 to 1,517 lin.ft., or 3,034 sq.yd. The production was increased to 1,767 lin.ft., or 3,534 sq.yd., on the following day. On Oct. 3 a total of 1,698 lin.ft. of main-line paving plus three turnouts was laid. The total for the five days is 8,629 lin.ft. of main line, or 17,258 sq.yd., plus 700 sq.yd. in the turnouts, or a total of 17,958 sq.yd. This gives a production per hour of 362.7 sq.yd. for the 55 hours that the crew worked during that time. If actual working time on paving is considered, the production per hour would be materially increased.

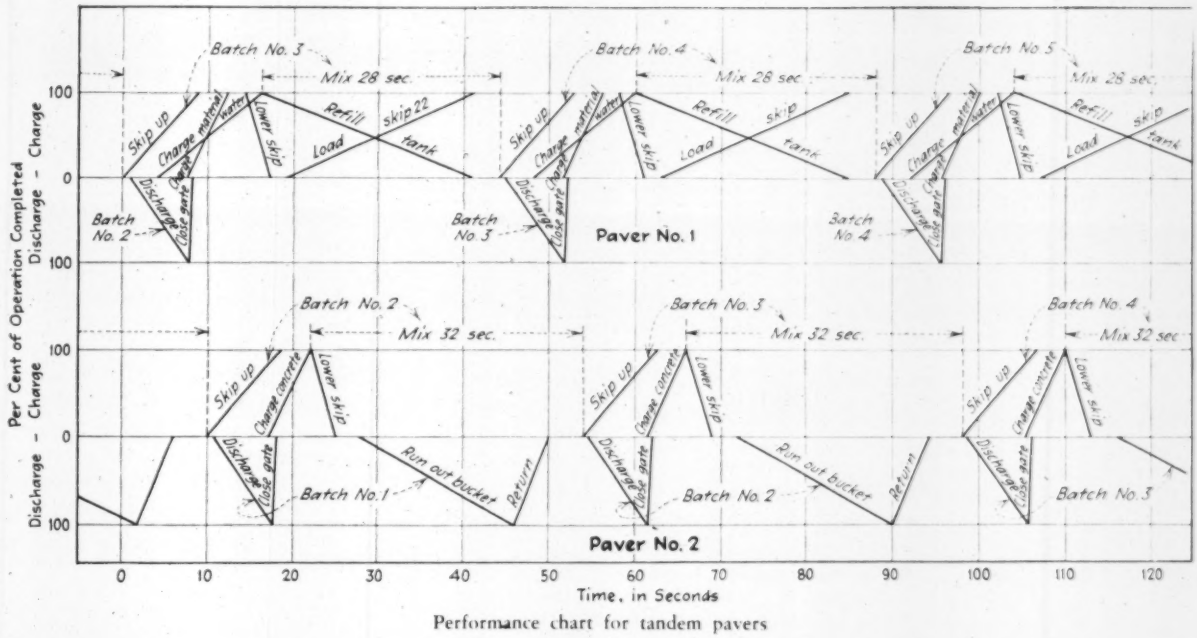
Developing the Plan

The contractor started early in the spring to find a way to increase the production of his paving crew without working long hours of overtime with the attendant time-and-a-half for extra hours. A study of the performance of his equipment showed that the material yard with industrial railway haulage could produce a great deal more aggregate and cement than the paver could handle, held down as it was by a specified mixing time. He decided that two pavers could produce more pavement than one without increasing the crew by an appreciable amount. An additional paver was purchased and placed alongside the regular paver. The skips of each paver were loaded by an independent power crane, which handled the batch boxes from the cars to the skips and return. As the raising of the skips interfered with the operation of the crane, and vice versa, it was found that the extra production of the two pavers did not justify the outlay for the additional paving unit. The contractor next tried the tandem idea of operation.

The two 27E pavers were placed in line and connected by a wooden tiebar. This tiebar kept the pavers at a constant distance apart, thereby insuring that the skip of the second paver would always be at the proper distance from the first to receive its discharge, and that the raising of the intermediate skip would not foul the first paver. An extension chute was used to bridge the gap between the discharge chute of the first paver and the



Pavers hitched in tandem produce 75 to 80 one-minute batches an hour



Performance chart for tandem pavers

receiving skip of the second. This chute was attached to the power discharge so that it would be extended while the partly mixed concrete was being discharged and would fold back out of the way of the skip while the swing chute was closed.

The aggregates and cement were dumped into the skip of the first paver. The skip was raised, thereby turning on the water charge and discharging the materials into the drum. After mixing the materials and water for 28 sec., the batch was discharged by means of the special chute into the skip of the second paver, which immediately raised the skip and charged its drum with the partly mixed concrete for an additional mixing of 32 sec. At the sound of the bell the batch was automatically discharged into the boom bucket for delivery to the grade.

No trouble was experienced from sticking of the partly mixed concrete in the intermediate skip. The operators were able to synchronize their operations to avoid confusion or delays. A check of the crew that is required to operate a tandem paver unit, producing an increased production, showed two paver operators, one hoist man, three dump men, four puddlers, two spaders, one steel man, one oiler, one tamping-machine operator, three finishers, two burlap men and one clean-up man.

The part mixing of the concrete in one paver with the remainder of the mixing given by a second paver seems to give added strength to the concrete. Beam tests of the concrete showed a strength of 760 lb. per sq.in., which compares very favorably with strengths obtained from the usual 1 : 2 : 4 concrete. A cement content of 1.42 bbl. per yard was used on this job.

Analysis of Operation

A chart has been prepared in order that the overlapping and corresponding operations of the two pavers can be studied. It shows that from three to four batches are in the process of charging, mixing or distribution at all times, which is the real explanation of how more than a batch per minute can be produced by a paving unit and still mix the concrete for a full minute.

Each operation of the pavers is shown by a line originating at the center, or zero line for each paver, and going up or down, depending upon whether the operation is a charge or a discharge. By noting the time of the origin of a line, or the starting time for an operation, and its end, which denotes completion of the operation, the time required for each function can be determined.

The chart shows that paver number one, or the receiving paver, raises its skip to charge its drum with batch number three as it discharges batch number two into the skip of the second or distributing paver. The skip of the first paver is held in a vertical position a sufficient time for all the materials to enter the drum. It is then lowered quickly in order that the loading crew may place batch number four in the skip. In the meantime, paver number two has raised its skip and charges its drum with the partly mixed concrete of batch number two, while it discharged the thoroughly mixed concrete of batch number one for distribution to the grade as it gives the final mix to batch number two. At 44 sec. after the skip of paver number one started up with the above-mentioned batch number three, the bell of this paver rings, batch number three is discharged into the intermediate skip, and batch number four is started.

A 2-sec. interval has been allowed between the time that it starts up to charge the second paver. Operating in this manner, it is possible to maintain a cycle of 44 sec., which will produce 82 batches per hour. As has been stated before, the contractors have produced 80 batches in a single hour, which is very close to the maximum that can be expected.

Model of Pipe Layout

Before making up a steam-distribution system the Detroit Edison Co. has a model made on a scale of ½ in. to the foot. The piping is made of wax extruded through orifices to give the desired dimensions. It has been found, according to J. H. Walker, assistant general manager of the company, in a recent talk to the Michigan chapter of the American Society of Heating and Ventilating Engineers, that both engineers and draftsmen visualize the finished job better and in consequence make a simpler layout.

Some Notes on Crane Runways—

More simple design possible with rolled structural-steel shapes —Sway bracing should be arranged in a horizontal truss system—Manufacturers should supply better crane-operating data

By J. E. TONNELIER
Structural Division, The J. G. White Engineering Corp., New York, N. Y.

ENGINEERS who have had the difficult task of maintaining in alignment a poorly constructed crane runway appreciate the virtues of good design and construction. For in spite of the long years of development through which the mill-type building and its appurnances have gone, many crane runways are still poorly designed and carelessly constructed. Operation of cranes on a runway that is out of alignment causes continual difficulties with creeping, excessive strains on the crane and its supporting structure, excessive wear on moving parts, high maintenance costs and unwarranted power consumption.

In an article in *Engineering News-Record* of Sept 4, 1930, p. 369, Robins Fleming, of the American Bridge Co., pointed out the fallacy of a design that had come to him for checking, in which the girders supporting some very heavy cranes were attached to the columns by means of brackets extending beyond the columns to provide the necessary clearance between crane rails and columns. Mr. Fleming's timely discussion has prompted the observations that follow, which are based on the author's experience in crane-runway design.

Stiffness is an important factor in good crane-runway design. Well-designed connections, as well as properly placed bracing, are needed to cause stresses to be distributed uniformly and to cause members to act in unison. Where cranes operate only occasionally, as in power houses or where inclosing walls provide ample support for columns, refinement in crane-runway design may not be absolutely necessary. But design is all-important in the open type of structure or in most mill buildings, where the wall covering adds no appreciable stiffness to the steel framework. Even where the walls do contribute stiffness originally there is always the danger that they will be altered or removed.

Rolled Shapes Simplify Design

The type of column support for crane girders, which Mr. Fleming has shown in his Fig. 2 and which is reproduced here in Fig. 1 (left), is the time-honored one, but just as practicable today as when it was first used. It was designed, however, when built-up columns and girders were the only members available. In this type of detail, since the end reactions of the crane girders are carried into the columns by direct bearing, the tops of the columns under the crane girders should be milled, and usually the crane girders should be provided with fitted end stiffeners. However, without the aid of knee-braces such crane girders have little effect in stiffening the crane columns.

With the advent of rolled H-column sections and wide-flange beams and girders, new designs in crane girders and crane columns became possible. At the right in Fig. 1 is illustrated one of these designs that the writer believes has some considerable advantage over the old built-up column detail. It requires no milling for the top of the crane column. The building column can be spliced to the crane column without providing for transfer of stress by direct bearing. The direct load from above is usually very light and can readily be transferred through a riveted splice, which can be made as strong in bending as that used with the built-up type of column. If the designer wishes a closed joint at this point, this is easily accomplished in fabrication by offsetting the splicing holes slightly and drawing the members together with drift pins. The connection of the crane girders to the columns is entirely a shear connection. Being a direct connection, no end stiffeners are required for the crane girders, and the column section acts as a splicing member for the girders. One flange only needs to be blocked at each end of each girder to clear the column flange, and no assembly or shop-riveting is required on any girder. A splice plate over the outside of the girder web will improve the looks of this connection and will help in providing continuity for the girders across the column. If greater shearing value for the connection is required than can be provided with rivets through the web of the girder, a bracket below the girder on the column face will supply the extra rivets. If a bracket is not required, then an erection seat angle should be provided below the girders. Such an angle aids in erection and improves the looks of the detail. Another advantage of this type of connection is that the stiffness of the crane girders is in large part added to that of the columns, making kneebraces usually unnecessary.

Some objections may be raised to this connection on the ground that it requires more metal and that it requires the driving of more field rivets than does the built-up column detail. Assuming that either or both of these objections holds, the gain in better construction is still worth more than the difference in price. Metal is about the cheapest thing that goes into the cost of fabricated steel. But the objections are not altogether valid, and

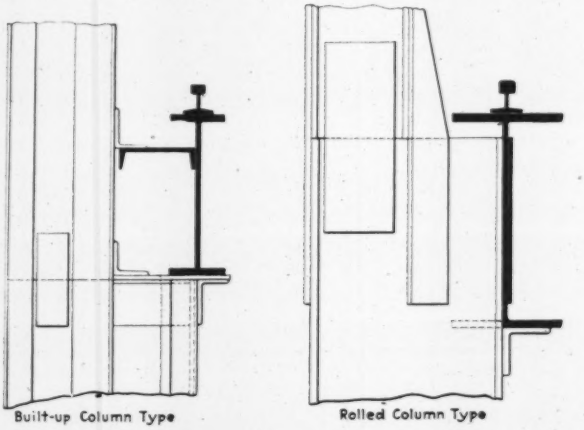


Fig. 1—Comparative crane-runway designs

in most cases are not valid at all. The actual difference in main metal is the weight of the excess length of the main column minus the weight saved by shortening the upper column. The saving in cost of a milled joint would more than offset the cost of this extra weight, and in addition there is the saving of a column cap to form the seat for the crane girder and the saving of a diaphragm for bracing the crane girders. There are more field rivets to drive, but, being more closely grouped, they are easier to drive than those on the built-up column. An additional point in favor of the rolled-column detail is that it lends itself as readily to welding as it does to riveting.

Column Design—In designing crane columns of the types indicated in Fig. 1 there are factors other than direct load that exert an influence. As compared with the bracketed type of column, these designs are relieved, relatively speaking, of all bending stress due to vertical loading; but they are subject to bending stresses of some sort in resisting horizontal loading. These bending stresses will depend upon the quality of fixity that may be attained at both the base and the cap of the column and upon the general characteristics of the building and

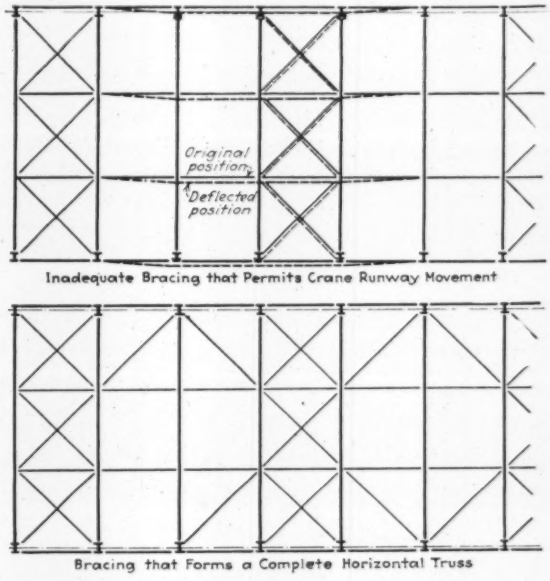

Original position
Deflected position
Inadequate Bracing that Permits Crane Runway Movement
Bracing that Forms a Complete Horizontal Truss

Fig. 2—Comparative bottom-chord mill-building bracing systems

its bracing system. The offset provided at the junction of the crane and building columns is more often determined by mechanical requirements than by structural design. It is customary to make the backs of both columns flush when the column under consideration is an outside one or where it carries only one runway girder. The resulting member, when resisting bending stresses, is a beam having a moment of inertia which changes suddenly at a point bearing no relationship to the bending stresses to which the beam may be subjected. Generally speaking, it is best to make the dimensions of the building column portion of these columns as large as possible and to make this portion as short as crane clearances will permit.

Although the ideal conditions that would prevail if these columns could be provided with absolute fixity at their bases are impracticable of attainment, the relative amount of fixity that may be secured economically should be provided. However, it should always be borne in mind that the more rigidly the columns are connected to their foundations the more effect the bending stresses will have in disturbing the even distribution of bearing pressures under the foundations; and this should be provided for in the foundation design.

Bracing Characteristics—In crane-runway design the amount and character of bracing used and its arrangement play a large part in determining whether or not the

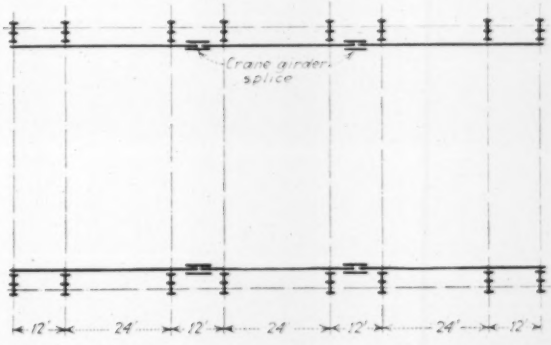


Fig. 3—Difficult crane-runway problem solved by a continuous-girder runway

runway will be easy to adjust and maintain in alignment. A crane runway in a mill building depends to a large degree on the bottom-chord bracing of the building roof trusses. The upper sketch in Fig. 2 shows the usual arrangement of bottom-chord bracing for Fink trusses, in which every third bay is braced against wind. The bottom chords are also considered as struts in planning the windbracing. Substantial eave struts in the plane of the bottom chords provide the ties that hold tops of the columns and the ends of the trusses to the proper spacing. Two lines of intermediate struts and ties also contribute to the bracing. The weakness of such a bracing system lies in the fact that it does not form a complete truss and has no resistance to the kind of distortion indicated by the dotted lines other than that provided by the stiffness of the joints, the members themselves being too slender to contribute much resistance. Distortion of the character indicated is reflected in misalignment in the crane runway supported below.

A better bracing system is shown in the lower sketch of Fig. 2. In this the bottom-chord plan becomes, in so far as bracing needs are concerned, a completed truss system in which the kind of distortion indicated in the upper sketch is impossible. In erecting, if the first bay is placed true and plumb, the remainder of the building is brought plumb and into alignment almost automatically. The only kind of distortion a building so braced may take is a uniform lateral displacement, either longitudinal or transverse, or a torsional displacement, neither of which will affect the alignment of the crane runway, which is maintained in position by end and side vertical-plane bracing and by the rigidity of the columns and their connections.

A Special Craneway Problem

In Fig. 5 is shown the solution of a crane-runway problem in a building in which the bays varied in width. The usual design for such a runway—a separate girder for each of the bay lengths—would have had several disadvantages: girders of different depths and flange widths alternating in the runway; difficulties with rail clips on the narrower flanges; necessity for lateral stiffening of

the smaller girders; three kinds of crane girders and two kinds of crane columns to handle in shop fabrication and in erection.

In the design used the crane girders were made continuous, splices being placed in the centers of the narrow bays. The results were uniform girder sections for the whole length of the runway; smaller girder sections because of continuity; a reduction in the number of kinds of girders to be fabricated from three to two; all crane columns made alike; fewer pieces to handle in fabrication and erection, and greater lateral stiffness in the runway because of continuity and fewer joints. Web splices were made with plates on the front sides of the girders and with channels on the rear. The flanges of these channels aided in providing lateral stiffness to the splices. The column detail is illustrated at the right in Fig. 1.

Designer's Need for Crane Data—It is unfortunate that the designer of crane runways seldom has available for his use sufficiently comprehensive data concerning the crane for which the runway is being designed. Frequently he has only the lifting capacity of the crane with which to work. Wheel base, wheel concentrations, clearances, lifting speed, trolley speed, bridge speed, acceleration rates, specific uses for the crane—all are unknown quantities.

The fault is not entirely with the engineer who plans the work. He is handicapped as well. The difficulty is more clearly a commercial one. While it is a perfectly normal condition that cranes supplied by different manufacturers should have different characteristics because of the different classes of duty for which they are designed and because some are of higher quality than others, the difficulty lies in the wide range of dimensional and mechanical characteristics offered by various crane manufacturers for the same duty. The engineer may settle in his own mind the characteristics most suited to the duty his crane has to perform; but unless he is willing to pay a large penalty in price, he is usually obliged to accept the nearest substitute that manufacturers offer. Even this choice may be denied him, for cranes are often purchased by competitive bidding, so that choice may also be limited by price consideration.

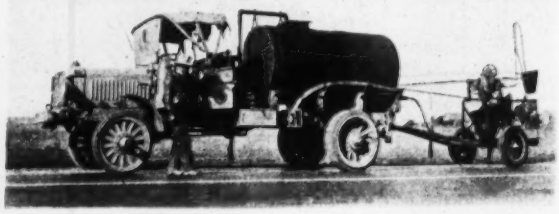
It seems that the manufacturers of cranes, with the enormous amount of data available in their hands, should be able to set certain standard limitations on the characteristics of cranes falling in the various classes of duty. Such codification would undoubtedly improve the usefulness of their apparatus; and it would be of great help to the engineer and to the structural designer. There is at work at present a committee of the National Electric Light Association which is codifying the characteristics of cranes for power-house use. When its work is completed it is hoped that it will aid in bringing about the classification of data for cranes in other classes of duty.

Roadside Weed-Burning in California

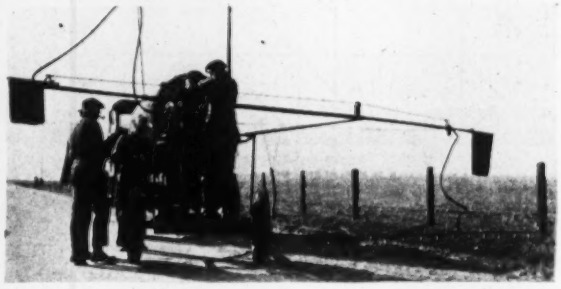
OIL SPRAYING followed by controlled burning are employed for weed removal to reduce fire hazard along California highways. A definite program for this fire-prevention work was begun in 1928 when burning was done along 660 miles of highway. Following an increased schedule in 1929, the program outlined for 1930 called for burning 1,020 miles of highway right-of-way at an expenditure of about $75,000. The work last year was done with a much improved type of spraying outfit developed by the headquarters equipment department of the division of highways and illustrated by the accompanying views.

The spraying unit consists of a 1,000-gal. tank truck and a two-wheeled trailer carrying the pumping and spraying equipment. A centrifugal pump driven by a small gasoline engine draws oil from the truck tank and discharges it through a ½-in. rubber hose to spray nozzles in a 9-ft. section of pipe, which is suspended from a light cantilevered frame. Control of the position and elevation of the spraying arm is governed by the operator standing on the platform of the trailer.

Diesel oil is used at a rate of approximately 0.1 gal. per square yard. The speed depends on highway conditions, but 9-ft. strips on both sides of an 8-mile road have been processed in a day. After a week to ten days the vegetation has withered and dried and is ready for burning. This is carried on under traffic control because of the possible hazard of smoke on the highway, and it costs $20 to $30 per mile, depending on the amount of control required. Consent and aid of the property owners are secured before burning; upon the owner's refusal, burning is omitted since it is believed that the state is not warranted in assuming a responsibility in creating a benefit which applies solely to the owner.



Weed-killing unit of tank truck and oil sprayer



Rear view of oil-spraying pump and sprayer head

The work is done in the spring when the adjacent vegetation is still green, and plans call for its completion before the end of March. Selection of roadsides to be burned involves a consideration of the bordering lands, preference being given to grain fields, grazing lands and heavy brush in the drier sections of the state. Although the primary purpose of the program is to provide a fire break between fires originating on the highways and the adjacent land, it is the policy of the department to cooperate with any farmer who desires to keep his property free from weeds by cleaning up the right-of-way in front of his property.

The work is carried out under the supervision of T. H. Dennis, maintenance engineer; C. H. Purcell is state highway engineer.

Draglines Excavate Large Irrigation Canal, Minidoka Project, Idaho

More than 6,200,000 cu.yd. of excavation, including 20 per cent hard lava rock, successfully handled by draglines—Traveling bridge speeds drilling in canal bottom

FOR MANY YEARS some 45,000 acres under the North and South Gooding canals of the Minidoka reclamation project in Idaho, for which water is diverted from the Little and Big Wood rivers, respectively, has received only a partial irrigating supply. Water shortages have been common, and frequently the supply is only 30 or 40 per cent of the demand during the irrigating season. Completion of the American Falls reservoir assured a supply on the Snake River sufficient to permit a gravity diversion to supplement these Wood River supplies and at the same time to put water on about 35,000 acres of new land lying north of the Twin Falls North Side main canal. These locations are shown on the accompanying map.

The diversion point for the new Milner-Gooding canal is at Milner dam on the Snake River about 10 miles west of Burley, the headquarters of the Minidoka project. For 3½ miles the canal has 2,500- to 2,700-sec.-ft. capacity and parallels the Twin Falls North Side canal, which also diverts at the Milner dam. At the end of this section 1,000 sec.-ft. can be delivered into the Twin Falls canal. This incidental conveyance service is not directly related to the principal uses of the new canal but proved an economic means of increasing the diversion capacity of the Twin Falls North Side canal.

From this 1,000-sec.-ft. delivery point the new canal with 1,550-sec.-ft. capacity extends 50 miles through rolling desert country to the crossing of the Little Wood River. Subsequently laterals will be built from the main canal to deliver 700 sec.-ft. of water to: (1) the 20,000 acres of unentered public land lying between it and the Twin Falls North Side canal; and (2) about 15,000 acres of land now without water rights in the Wood River valley. At the Little Wood River 500 sec.-ft. will be released for downstream rediversion into the present South Gooding Canal. Continuing with a 500 sec.-ft. capacity, the canal extends about 3½ miles across extensive lava beds and thence mostly in earth section for about 7 miles to its terminus at the North Gooding Canal, where it supplements the flow in that system.

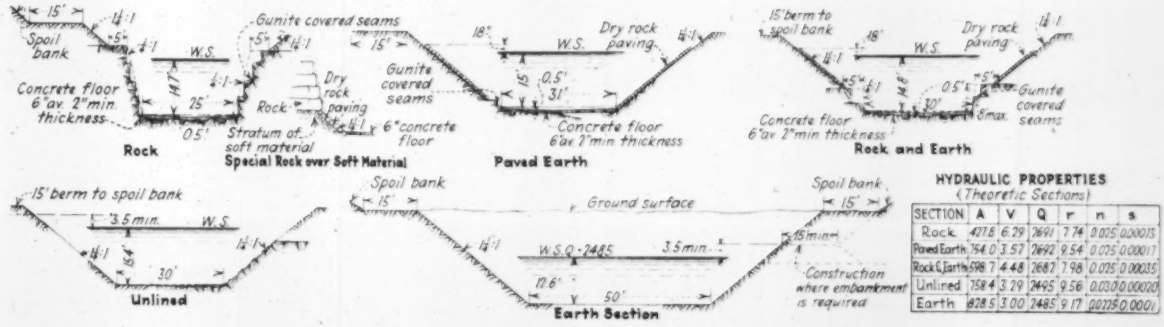
ABOUT 6,200,000 cu.yd. of earth and rock is being handled by dragline excavators in constructing the new 65-mile diversion canal for the Minidoka irrigation project in Idaho. The width of the canal in earth demanded the long reach of the dragline for overcasting, and in the rock sections this machine proved so capable of handling blasted material that no substitute seemed warranted. In addition to the dragline excavation, the sealing of sections of rock canal presented features of interest.

Canal Design and Structure

Cross-sections of the canal in various types of material and the hydraulic properties for each section are given in the accompanying drawings. The canals for smaller capacity are, in general, similar. The concrete floor and gunited seams to prevent excessive leakage in the rock cuts near the head of the canal were provided to meet special rock conditions in lieu of the usual concrete lining originally planned. In earth, where velocities were high, the banks were paved with dry rock, but earth sections were unlined if economy permitted large cross-section. The maximum cut in rock was 45 ft.; earth cuts reached a depth of 36 ft.

Except for portions of ditch in rock cut, the banks were built of earth, either from ditch excavation or from borrow, if excavation did not provide sufficient material. This earth stripping or borrow was built up first to form the canal banks, and then the rock excavation was blasted and placed on the outside of the canal banks. This construction gave the advantage of an earth ditch bank backed by the weight of rock to assist in maintaining its position.

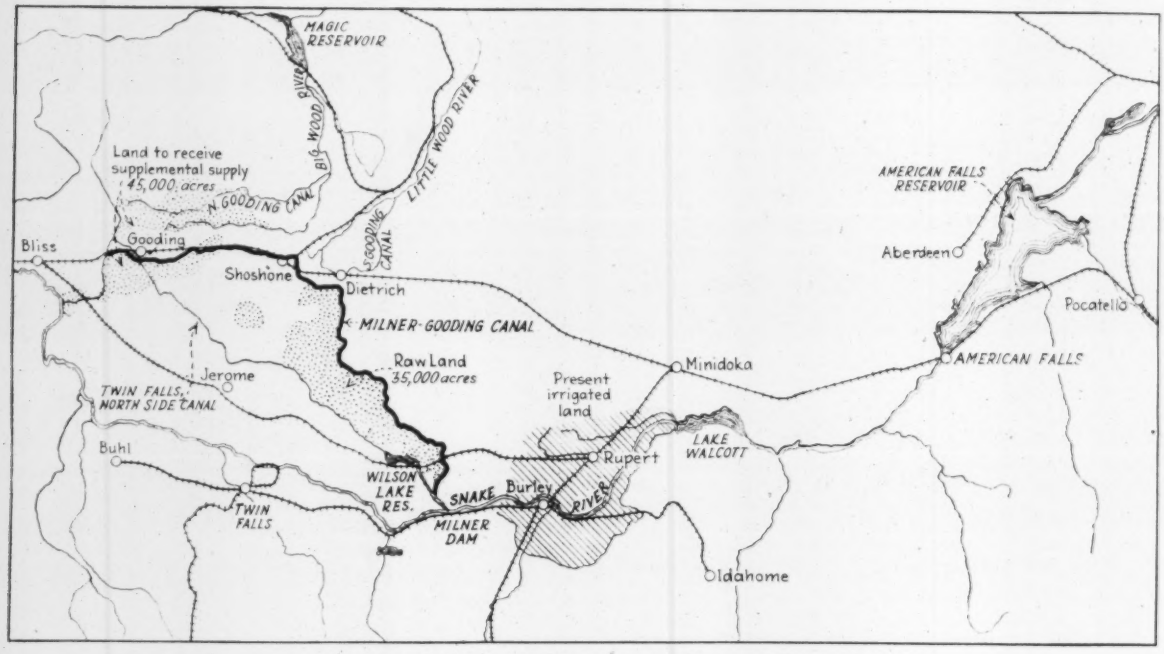
In several places satisfactory alignment necessitated establishing the canal bottom at grade or, on some short sections, on fill with a maximum height of 4 to 6 ft. Special provision for watertightness was made where this fill was built on rock or where the ditch bottom ran at grade on exposed rock. In these cases a cutoff trench 3x3 ft. was blasted out of the rock under each canal bank and was carefully filled with earth. This cutoff trench provided a key to lock the built-up ditch bank onto



HYDRAULIC PROPERTIES
(Theoretic Sections)

SECTION	A	V	Q	r	n	s
Rock	427.6	6.29	2691	7.74	0.025	0.00015
Paved Earth	754.0	3.57	2692	9.54	0.025	0.00017
Rock & Earth	698.7	4.48	2687	7.98	0.025	0.00035
Unlined	758.4	3.29	2495	9.56	0.023	0.00030
Earth	828.5	3.00	2485	9.17	0.0225	0.00041

Canal sections in various materials with table of hydraulic properties



Map of Minidoka project, showing new Milner-Gooding canal

the rock and also an additional factor against leakage along a rock surface.

Earth Excavation

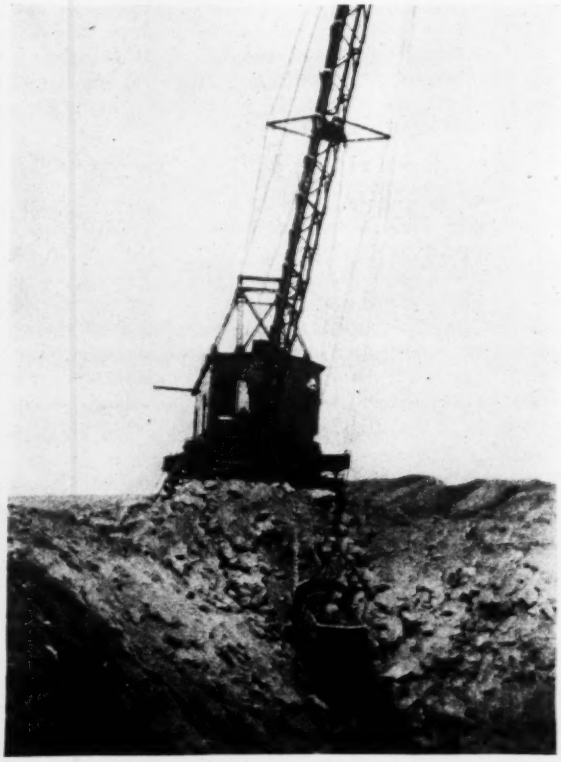
Draglines of 2- and 2½-yd. rating, equipped with oversize buckets of from 3- to 3½-yd. capacity, constituted the earth-excavating equipment for most of the work. The machines, which were principally diesel-engine driven, operated 24 hours a day with crews consisting of operator, oiler and clean-up man. Where the canal was all earth excavation the dragline was used to complete the entire cross-section, with the exception of occasional bank trimming by smaller power units. At one location the proximity of commercial electric power permitted economic use of a 5-yd. electric dragline with a 125-ft. boom.

In sections where the excavation extended into rock the dragline moved along stripping the earth and building banks. If the earth stripping was not sufficient to build the banks borrow material was used. For small quantities of borrow a single cast of the dragline often was sufficient to complete the ditch bank. For a more extensive yardage the material was brought in either by double-casting with the dragline or by trucks. The experience in using trucks to transport borrow material was not particularly successful. Desert conditions involving sandy dust produced excessive wear on truck equipment, resulting in a large amount of maintenance work made particularly expensive by the isolated location. With the short borrow distances encountered on this project, moving the material by draglines was frequently more economical, even when requiring a double or triple throw. The average excavation per shift for a 2½-cu.yd. dragline in ordinary earth was about 1,000 cu.yd., and the 5-yd. electric machine was able to handle 2,000 cu.yd. per shift in average earth work.

Rock Excavation

Canal construction in rock varied from solid cuts of 45 ft. maximum depth to almost nothing where the canal bottom was located on the rock surface. The rock is of lava formation, easy to drill but difficult to blast economically because of the seams. In the deep rock cuts the main difficulty was to secure good breakage; seams and clay pockets often resulted in shots failing to do effective work.

With 1 on ¼ side slope in rock and cuts 12 to 20 ft. deep best results were obtained by using a 12-ft. spacing of holes across the canal with 8-ft. spacing longitudinally.



Five-yard electric dragline handling blasted rock

Deep cut in rock where shovel-loaded skips were hoisted out by dragline

the holes drilled 4 ft. below grade. The material broke so large that about 30 per cent had to be chained out, although the machines were equipped with 2-yd. buckets. In the deepest cut a power shovel was used to load the rock into skips for removal by a dragline operating as a crane on the edge of cut.

On sections of considerable length the excavation involved earth stripping to half depth followed by rock work, say, 4 to 8 ft. deep to complete the canal. The majority of this type of rock excavation was done by Mittry Brothers, of Los Angeles, who developed methods that proved most efficient.

Experience proved that shooting off a face was not effective and that the best method was to drill vertical holes at 4-ft. spacing in cuts less than 8 ft. In cuts deeper than 8 ft. the spacing was increased to 8 to 12 ft. Holes were drilled to a depth of about 4 ft. below bottom grade. To devise mobile equipment for this extensive drilling program was the major problem. The original scheme of the contractor was to provide a rigid frame on the rear of a crawler tractor holding three drills 4 ft. apart. This device was mobile enough but did not have the capacity necessary for the quantity of work required.

As a result, the contractor devised a truss to span the canal between banks and to carry three drills that could be moved on tracks along the truss. Each drill was equipped with an air hoist to move it in the vertical carriage, and movement along the truss was by hand. No water was used in drilling, but an additional air line was used on the drills to supply sufficient air for cleaning the holes. Air was furnished by a bank of three portable compressors at the side of the canal supplying air to receivers lovated on the truss. The ends of the truss rested on 24-in.-gage track, and a hand winch at each end was used to move the equipment forward when a row of holes had been completed. So successful was this device that the contractor placed a second similar unit in operation.

Immediately behind the drilling crew the holes were loaded. For rock depths of more than 8 ft. it was the practice to spring the holes one to three times. Forty per cent gelatin powder was used on most of the work. Blasting often involved the firing of as many as 3,000 holes at a time, requiring 57,000 lb. of explosive along a 500-ft. length of canal.

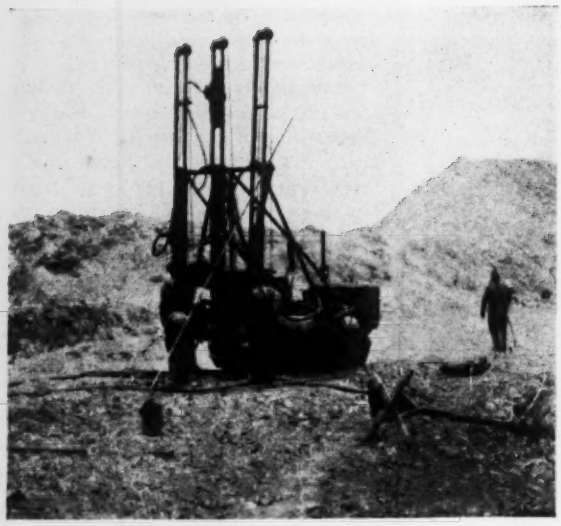
The oversize dragline buckets proved to be very effective in loading the rough, unevenly broken rock. The long reach of the machines readily permitted wasting the material in average cuts. On one contract an electric shovel with a special 55-ft. boom and 35-ft. dipper stick, driven by a separate diesel plant, was used for rock excavation.

Sealing Canal in Rock

The original plans for the deep rock cut near the head of the canal called for concrete lining of the entire water section to provide smooth surfaces and consequent high velocities, thus permitting the selection of a minimum width for the canal base. The contractor found it difficult to avoid excessive overbreak in the material encountered, however; and the resulting irregularity of the side slopes made concrete lining inadvisable. The plans were changed to provide a concrete floor averaging 6 in. thick and watertightness was secured by guniting all seams in the side walls.

The concrete floor was paved with a 1-cu.yd. paving mixer working in the canal. Joints every 20 ft. were made with ½-in. steel plates, which were later removed and the space filled with asphalt. During a particularly severe period of cold weather a length of floor for three days' concreting was housed under canvas stretched across the canal high enough to clear construction operations. Temperatures under this covering were maintained at 40 deg. by salamanders. Guniting the walls also was carried on during cold weather behind burlap.

Truss spanning canal developed for large-scale drilling operations after earth stripping



Drills mounted on tractor provide mobile unit

The first two-thirds of a mile from the headworks developed a seam of fine sand and clay from 1 to 10 ft. thick near bottom grade, lying in a practically horizontal position. This material was very porous and needed protection against the 3- to 6-ft. velocity. The solution was to cover this seam with a masonry wall 18 in. thick at the top on a 1 on $\frac{1}{4}$ slope extending between the floor slab and the solid rock on the wall above. This masonry wall was sealed to the rock above with a gunited apron.

As the upper sections were finished the water was turned into the canal for priming. Consolidation of the built-up banks was obtained by plowing a shallow ditch on the crown and pumping water into it from the canal. This work was not included in the construction contract and was handled by government forces.

Organization—The project work is under the direction of Elwood Mead, commissioner, and R. F. Walter, chief engineer of the U. S. Bureau of Reclamation. E. B. Darlington, superintendent of the Minidoka project, is in general charge of the Gooding division program. Canal construction work was under immediate direction of J. K. Rohrer and C. H. Spencer, associate engineers. Principal contracts were held by Derbon Construction Co., Seattle; Winston Brothers, Minneapolis; John Phillips Co., San Francisco; Mittry Brothers, Los Angeles; Haas, Doughty & Jones, San Francisco. The Utah Construction Co., Ogden, Utah, built the railroad and river-crossing structures, and Morrison-Knudson Co., Boise, Idaho, held the contract for excavation and the concrete flume across the lava flows between Little Wood River and Big Wood River.

Airplane Speeds Canadian Survey

Sites for triangulation stations in a strip of country 800 miles long and from 15 to 30 miles wide extending from Sudbury, Ont., to the northwest end of Lake Nipigon were selected in four weeks by two members of the Geodetic Survey of Canada, using two airplanes belonging to the Royal Canadian Air Force. Cabin monoplanes fitted with skis were used, operating from three bases in the area.

Effective Oil-Waste Disposal

SALT WATER and mud brought up as byproducts of oil-field operations at Santa Fe Springs, Calif., constitute so great a problem that twenty oil companies cooperated about two years ago in forming the Santa Fe Springs Waste Water Disposal Co., for the purpose of making a joint endeavor to solve the problem in its entirety for the several member companies. The resulting disposal plant, whose methods of operation were described in *Engineering News-Record*, May 16, 1929, p. 795, now has been in operation more than a year. A recent annual report, from which the following has been taken, indicates that the oil-reclamation and waste-disposal schemes have worked out in a highly satisfactory way and that the plant is making it possible, at a low unit operating cost, for the member companies to continue oil production without creating the serious nuisance that otherwise certainly would occur in this field.

Since the waste-disposal company was formed, membership has increased until 33 oil companies, practically every operating company in the district, are now members. At the same time the scope of operations at the disposal plant has been materially extended from that contemplated at the outset. The plant, which consists of a series of settling and skimming basins, designed after extensive experiment, has been handling a daily average of 79,411 bbl. of water, or 75 per cent more than the amount contemplated in the original estimate. This water is discharged into the ocean 15 miles from the plant after the oil and mud content have been removed.

During the year the oil recovered and sold amounted to 53,820 bbl. Revenue from this oil amounted to more than $20,000 for the year, or almost half the total operating expense of the plant. The effectiveness of the oil-separation system is indicated by the fact that the oil content of water discharged into the ocean is less than 10 p.p.m. Despite the heavy overload on the plant as compared to the original estimate, the total plant investment of $487,000 represents an increase of only 8 per cent beyond the original estimate.

One of the unexpected problems was the excessive amount of rotary drill mud pumped into the plant with the salt water. More than 16,000 tons of mud has accumulated at the plant, necessitating the purchase of additional land for mud storage. Another unexpected element was surreptitious use of the plant by a non-member oil operator. Such a case was discovered recently where not only waste water and oil but heavy rotary drill mud was being pumped into the collection system by an operator who was not a member and who refused to join. Patrolmen and frequent inspections are now used to prevent the recurrence of such unauthorized connections to the pipe system.

The total cost of operations for the year, during which 18,964,603 bbl. of water was discharged into the ocean, amounted to $1\frac{1}{3}$ mills per barrel. This cost has been pro-rated among member companies on the basis of the member's daily average contribution as metered at the point where his discharge line connects with the waste-disposal collection system.

Operations of the waste-disposal plant are continuing under the direction of C. C. Scharpenberg, chief engineer, production department, Standard Oil Co., who is president, and H. L. Emerson, of the General Petroleum Co., who is secretary of the Santa Fe Springs Waste Water Disposal Co.

Protecting Steel Pipe Lines With Thin Concrete Covering

EXPERIMENTS on the covering of steel pipes with concrete have recently been carried out at the laboratory of the Portland Cement Association. Soil corrosion varying in intensity with local conditions is estimated to cause the expenditure of $100,000,000 annually for the protection and replacement of oil and gas lines. As there are 300,000 miles of such lines and the number is being increased at a rapid rate, the problem of protection is serious. Bituminous and wrapped coverings are the usual protective measures. In certain limited sections, where alkaline and other corrosive action is pronounced, concrete, crudely applied and expensive, has given satisfaction. It was with a view toward cost reduction and to learning of more practical methods of application with high-quality concrete that the laboratory undertook the following recounted investigations.

A mixture consisting of 1 part portland cement, 1½ parts well-graded sand (0 to ¼ in.) and 3 parts of gravel (¼ to ⅜ in.) was made with 4¾ gal. of water per sack of cement. This mixture was placed on a 10-ft. section of 8⅝-in. pipe. The concrete covering was 1¼ in. thick. The form was made of 14-gage galvanized sheet metal, divided into halves with an opening at the top and held off the pipe by collars at each end. Welded wire reinforcement, 2x6 in., 12-gage, was placed around the pipe and held halfway between the pipe and the form. A vibrator was fitted to the top of the form and operated as the concrete was inserted. In spite of the unworkable appearance of the concrete, it compacted readily into place and produced a dense covering with no honeycombing or segregation of materials. A slightly modified mix having more workability, made in the proportion of 1:1.35:2.27 and mixed with 4¾ gal. of water per sack of cement, produced an equally satisfactory covering.

Experiments were also made to determine the resistance of concrete coverings to possible circumferential increase of the pipe due to internal pressure. At the same time the value of reinforcement and the effect of a cushion between the pipe and the concrete were determined.

A 10-ft. length of 8⅝-in. 25-lb. pipe with a wall thickness of 0.277 in. was divided into four sections and each covered with 1¼ in. of concrete, proportioned 1 : 1½ : 3, with 4¾ gal. of water per sack of cement. On two sections the concrete was applied directly to the pipe. Two sections were applied over a thin asphaltic emulsion coating. One section of each was reinforced and one left plain. The reinforcement was welded No. 12 mesh, 2x6 in., with the 2-in. spacing running circumferentially.

The forms were removed within 24 hours, and the concrete was cured under damp burlap for fourteen days. The pipe was then filled with water and attached to a high-pressure drum of nitrogen. Pressures up to 1,000 lb. per sq.in. were built up in 100-lb. increments, held for a time, released, and again built up. This was repeated many times. At some point between 900 and 1,000 lb. a longitudinal hair-line crack developed in the unreinforced section of covering applied directly to the pipe. An increase in diameter of 0.00011 in. was recorded by the strain gage on the unreinforced section. None of the other sections cracked under the applied pressures. The unreinforced section over the asphaltic emulsion showed an increase in diameter of 0.00005 in. at 1,000-lb. pressure.

The value of the reinforcement was shown clearly, as was the value of the asphalt emulsion. Due to the inevitable abuse incidental to handling and placing the pipe in the trench, it is recommended that reinforcement always be used. Reinforcement is particularly important when coverings are applied in a central plant and the covered pipe then hauled to the site.

Tests on Gunite Covering

Similar tests were made to determine the value of a gunite covering. One-half of a 10-ft. length of 8-in. pipe was covered ¾ in. thick, the other half with a 1-in. covering, both reinforced with 2x2-in. No. 12 welded wire mesh. A 1 : 3 mixture was used, and it was estimated that a 1 : 2½ mix remained on the pipe. After fourteen days hardening and curing the covered pipe was submitted to repeated internal pressures of 1,000 lb. per sq.in. No visible cracks nor any signs of failure appeared in the covering. It was found that the covering was not of constant thickness, varying from ½ to 1 in. On pipe of larger diameter a more uniform covering could be placed, in which case there would be materially less waste.

It was concluded that concrete coverings should be at least 1 in. thick. About 0.3 per cent reinforcement should be placed circumferentially around the pipe, with sufficient longitudinal wires to hold the main reinforcement in position. A 2x6-in. mesh, No. 13, with the 2-in. spacing running circumferentially, is suggested for a 1-in. covering. A 3x6-in. mesh, No. 12, provides the equivalent area and in some cases may be more economical. Reinforcement should be carefully placed so as to be located in the center of the covering. It is important that the reinforcement have a minimum of ½-in. protective covering. If a vibrator is not used to compact and place the concrete, a greater thickness should be used to insure the placement of a dense dry concrete free from honeycombing and segregation.

The use of concrete as protective covering on pipe lines is not a new and untried method. The following list, indicating a few cases where it has been used successfully, is given with report of condition by the engineer investigating the pipe-covering problem.

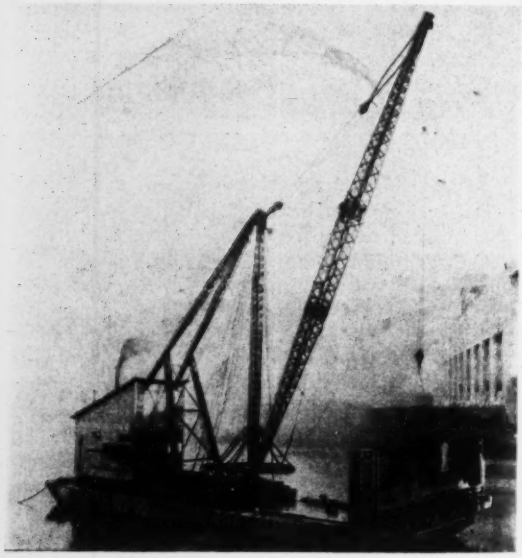
The Temescal Water Co., Corona, Calif., in 1914, coated 8 miles of 10- to 30-in. pipe with 3 in. of concrete. After sixteen years' service the pipe and coating are in excellent condition. Between 1913 and 1920 the Standard Pipe Line Co. coated 180 miles of 8-in. oil line with a 1 : 3 cement and coarse sand mortar. Located in Louisiana swamp land, this coating has given perfect protection and has required no repairs or replacement. To check serious disintegration of steel pipe by alkaline soils, the Dominguez Water Co., Los Angeles, Calif., has coated more than 8 miles of 8- to 30-in. water lines with 2 to 3 in. of reinforced mortar made in the proportions of 1 part cement to 2 parts sand. The first coating was applied in 1917. This covering has given perfect protection and has required no repairs or replacements for thirteen years. Several years ago the Sweetwater Water Co. at Laguna Beach, Calif., coated 8 miles of 30-in. x $\frac{3}{16}$-in. steel-plate pipe line with a thin coating of gunite applied over light reinforcement. This covering is in excellent condition, and the pipe is free from any trace of corrosion. At the present time the Indiana Pipe Line Co. is reconditioning oil-pipe lines by coating with a 1 : 3 cement and sand mortar, placed by means of a sheet-metal form similar to the one described herein.

FROM JOB AND OFFICE

Hints That Cut Cost and Time for the Contractor and Engineer

Steel-Skid Derricks on Osage Hydro-Electric Project

SIX steel-skid derricks, adaptations of skid piledrivers equipped with 110-ft. cargo booms, were put to a variety of uses on the Osage project, built near Bagnell, Mo., by Stone & Webster Engineering Corp.



Steel-skid derrick on scow, Osage project

for the Union Electric Light and Power Co. (*Engineering News-Record*, March 26, 1931, p. 523.) The rigs were originally designed to set and drive more than 8,000 steel sheetpiles from 50 to 60 ft. long; but they traveled all over the job under their own power and helped out wherever a derrick was needed. Equipped with clamshell buckets, they were used for excavation and refill; and mounted on a scow, they became first-class derrick boats used for driving piles, hoisting gates into place, removing reservoir drift and other functions of floating derricks.

Design Features—Operated by a bull wheel, the 110-ft. boom is capable of a 180-deg. swing. The derricks are rated at 8 tons capacity. With the boom in top position, the load block is less than 8 ft. from the center of mast. A few guys are required while the derrick is working, but less than the number required by a guy derrick, and the guys do not interfere with the 180-deg. swing of the boom. In traveling with boom in top position, the balance of the rig permits moving forward or backward over bents spaced 12 ft. on centers and on grades up to 20 per cent. These derricks require less space than stiff-leg types and have no weight boxes. By using long skid timbers they can work over soft ground.

All of the steel sheeting for the cofferdams was driven by the skid derricks, using steam hammers in swinging leads, and many of the sheets were pulled with the same rigging, using pulling hammers. The machines were particularly adaptable to building both wood-crib and steel-sheeting cofferdams where it was necessary to carry a track alongside the derrick as the work progressed.

Cost of Equipment—The following estimates give a comparison of cost for guy, stiff-leg and skid derricks, all of 8 tons capacity with 110-ft. booms and without power: guy derrick, $3,270; stiff-leg, $4,240; skid, $6,000. Similar power is applicable to all three types, one 9x12-in. double-cylinder three-drum hoisting engine with 49x110-in. boiler and 5x7-in. double-cylinder throttle-reversing slewing engine. Cost of hoisting engine, $4,120; of slewing engine, $830.

Reaction, Shear and Moment Chart

By ERNEST McCULLOUGH,
Consulting Engineer, Long Island City, N. Y.

THE accompanying chart is an extension of, and improvement upon, the chart presented in *Engineering News-Record*, Oct. 10, 1929, p. 586. It is copyrighted, and the writer hopes it may be printed on thin transparent celluloid, the material he uses. Engineering assistants are at liberty to make reproductions for personal use on celluloid, tracing cloth or tracing paper. Being used generally over blueprints, experience has shown that the lines should be drawn, preferably, in yellow or orange ink instead of black, white or red. Scratched lines and figures in celluloid should be filled with colored ink.

How to Make One—The top horizontal line has a length of 6¼ in., so that it may be used on a 25-ft. span on a ¼-in. scale. The vertical line on the left is drawn to a length of 4 in., the lower end being used as a point from which to draw the sloping lines that divide the top horizontal line into twenty divisions. The bottom horizontal line is drawn ⅞ in. from the point, the sloping lines below it being then erased.

How to Position It—Place on the center line of the girder or beam carrying concentrated loads with the horizontal lines parallel with this load-bearing member and the "support" lines passing through the supports.

To Obtain Reactions—Multiply each load by the

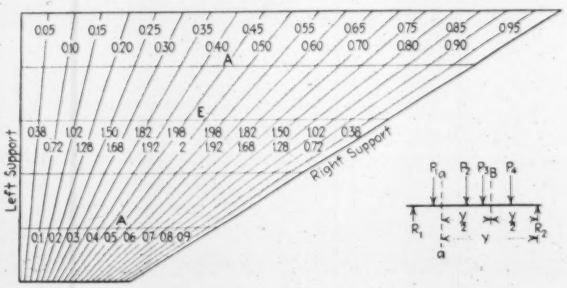


Chart for determining beam reactions, shears and moments

decimal factor A on the intersecting sloping line, interpolating if necessary. Reaction R_2 is equal to the sum of these products plus half the weight of the girder, and R_1 = (sum of loads + weight of girder) — R_2.

To Obtain Shears—First prefix the negative sign to each load. From $+R_1$ subtract each load successively from left to right, half the weight of the girder being assumed as a concentrated load at each quarter point. This assumption is close enough for all practical purposes. If closer results are desired use the following concentrations: 0.25 W at 0.08 L, 0.17 W at 0.25 L and 0.08 W at 0.417 L. Maximum shear at left = $+R_1$, and at right end = $-R_2$. Maximum shear (at point of maximum moment) occurs where the sign changes from positive to negative.

To Obtain Moment at Any Point on Span—Draw a vertical line, *a-a*, through the point. Obtain reactions and shears as explained above. Scale moment arm, y, from R_2 to line *a-a*. (Note: it is preferable to use a scale, but the distance $y = L \times$ reciprocal of A, this being mentioned merely as a check.) Then $P = R_2 y$.

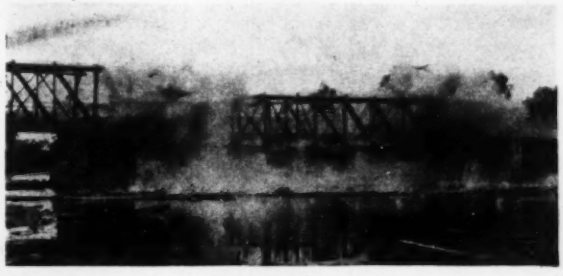
Shift the chart so that line *a-a* becomes the left support. Weight of the beam over length y is a concentrated load at B, this point being the center of gravity of length y. Then multiply each load by decimal factor A on intersecting sloping line and add the results. Let Z = sum of results $\times\ y$. Then $M_{a\text{-}a} = P - Z$.

Method of Equivalent Distributed Load—For quick results on preliminary work, concentrated loads may be reduced to an equivalent distributed load, which will give a slightly larger moment at mid-span than the true moment. With chart positioned, multiply each load by the decimal factor E on the intersecting sloping line. W = sum of products + weight of girder. Then $M = \frac{WL}{8}$ at mid-span. Reactions and shears for this condition are found as explained above, the approximate method for finding maximum moment not altering the other values.

Timber Bridge Removed by Explosives

By L. R. BARTON
With Green & Wilson, Waterville, Me.

DYNAMITING proved to be a quick and safe way to remove three 100-ft. spans of an 80-year-old covered bridge at Ashland, Me. The roof, side boarding and floor were all removed, likewise all cross and sway bracing, except that needed to keep the trusses upright. In the bottom chord and end diagonal of each truss 40 per cent dynamite was placed and fired by battery, cutting the members simultaneously and dropping the span into the river. A hoisting engine pulled the trusses ashore to be quickly taken apart.

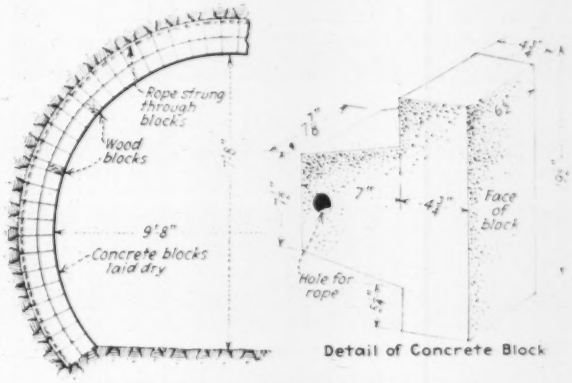


Dropping bridge span with dynamite

A surprising thing in this connection was that the fall of the trusses to the nearly dry bed of the river caused no visible damage to any of the members. The only timbers damaged were those cut by the dynamite. Altogether, it required 31 lb. of dynamite for the three spans (six trusses). All charges were fired by No. 6 electric exploders. The loading and shooting was done by E. C. Wilson, assisted by H. L. Gosselin. The general contractors were Green & Wilson, of Waterville.

Concrete Blocks Threaded on Cable Form Flexible Tunnel Lining

A FLEXIBLE concrete lining for tunnels, intended for use in the haulage tunnels of mines to permit of slight distortion under pressure or movement of the ground which might wreck a rigid lining or ordinary timbering, is a novel form of construction placed experimentally in a mine of the Hudson Coal Co., at Scranton, Pa. As described by E. C. Weichel, assistant general manager, in *Mining and Metallurgy*, the organ of the American Institute of Mining and Metallurgical Engineers, the lining was first placed where roof pressures were heavy, so that heavy timbering lasted only twelve to eighteen months. It has since been used in several parts of the mine.



Flexible lining and lining block for tunnels

The lining consists of locally made concrete blocks, 19½ in. long on the face, weighing about 75 lb., built up to form independent rings, but laid without mortar or cement between the blocks or the rings. Thus any one ring may shift or distort slightly without affecting the lining as a whole. The blocks are of T shape, about 12 in. deep over all, the stems forming an arch rib around the lining and having a hole through which pieces of old wire rope are passed as reinforcement. Furthermore, along each side of the arch are placed two or more longitudinal fillers of narrow creosoted wood blocks, which will compress under movement of the arch as it adjusts itself under pressure. Steel ribs form the falsework or centering upon which the arch rings are built.

Where the pressures are not excessive the lining rings may be about 20 in. apart, with lagging or dry packing between them. This method has been used in replacing broken timber lining.

In the first installation the arch is about 22 ft. wide

and 12½ ft. high. The lining, which is slightly distorted in places, has been in service eighteen months without requiring any maintenance. Mr. Weichel states that during this period it would have been necessary to replace completely the timbering. In other places the tunnel is 9 ft. 8 in. wide and 7 ft. 8 in. high. The concrete-block lining gives much less obstruction than ordinary timbering. Its cost is given as $17.29 per set or ring, as compared with $9.85 per set for common timber, or $22.50 for treated timber; while the labor cost for replacing a timber set is $5.50, as against $2.75 for new timbering. This system is a German invention, patented by Hans Schaefer, of Essen, and licensed to Richard Howells, of Scranton, Pa.

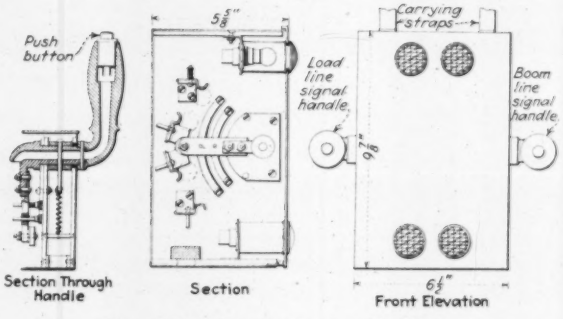
Electrical Signaling Device for Cranes and Derricks

A NEW electrical signaling device for use in derrick and crane operation is designed to replace the bell-cord signaling system now in common use on building construction. It was successfully demonstrated on the steel erection of an extension of the Macy department store in New York City by A. E. Norton, Inc., subcontractor on steel erection, and has been approved by a prominent insurance company. The signaling apparatus consists of a control box, carried by the signal man, and an indicator panel in the hoist operator's booth, connected by rubber-covered electric cable in 100-ft. lengths. Both the control box and signal panel are shown in accompanying illustrations. The system works on the 220-volt power line feeding the hoist engine, and therefore can be used as soon as the power for the hoist is available.

The control box is carried by straps around the shoulders or waist of the signal man. Two signal control handles are located on the sides of the box, that on the left for the boom line and the other for the load line. They are moved up or down to signal corresponding movements of the load or boom line. The hoist operator is signaled by lights, each change of light, whether on or off, being accompanied by a stroke of a gong.

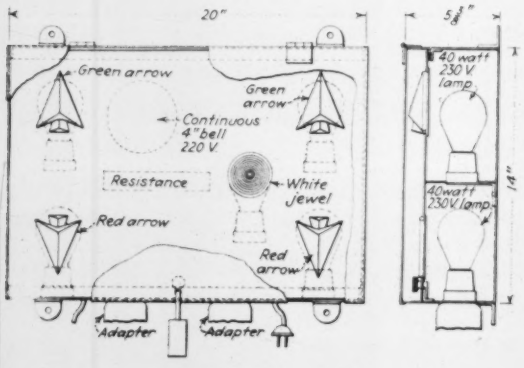
In operation the signaling system works as follows: When no movement is desired the handles are held in neutral. To indicate lowering the load line, the right handle is pressed down. This action strikes the gong in the engineer's booth and lights a red arrow pointing down. When the signal man desires to stop the downward movement he returns the handle to neutral, which rings the gong again and cuts out the light. An upward movement of the control handle rings the gong and lights a corresponding green arrow pointing upward on the engineer's panel. In addition to the main signal indications, a push button on the handle of the load-line signal operates a white light on the engineer's panel, which can be used for special signaling, such as short repeated flashes for fast operation or a steady light for slow operation. The boom-line signal is similar in operation, and a push button on this signal handle operates a continuous bell corresponding to the white light on the load-line signal. On the front of the control box there are four lights corresponding to the main signal lights on the indicator panel in the hoist boom. These, operating in conjunction with the signal lights, inform the signal man of any failure in the transmittal of signals.

This signaling system has a safety advantage of operating only by lights. Failure of the signal cords, either by being cut or damaged, prevents operation of the hoist. Under the present system of using bell cords the ropes are sometimes struck, giving a false signal, or may become jammed or broken. The bell-cord system also requires the signal man to remain in one place.



Control box for electric signaling device

The apparatus was designed and patented by Ralph Maxwell, 41 West 97th St., New York City.



Signal panel at hoist

Initial Stress on Tightened Bolts

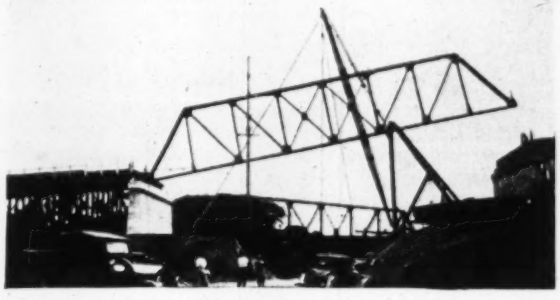
THE EXPERIMENT with the spring-scale apparatus that Thomas E. Hadley, of the Fisher Body Corp., used to support his contention that a tightened bolt will take no additional stress regardless of the load applied until this load exceeds the initial tension (*Engineering News-Record*, March 26, 1931, p. 532) has been called a special case by a number of readers. Professors Thompson and Slaymaker of Southern Methodist University (Dallas) emphasize this by pointting out that "the modulus of elasticity of his bolt (a spring balance) is very low in comparison to the modulus of elasticity of his wooden frame." William S. Hewett, Minneapalis, Minn., designer of reinforced-concrete tanks and similar structures around which steel bands are used to prevent tension in the concrete, makes similar comment. Frederick W. Henrici, American Bridge Co., Pittsburgh, gives a simple and practicable explanation of the phenomena observed by Mr. Hadley, pointing out that "when initial tension is applied to the bolt it is resisted by compression of equal amount in the wooden frame, and the frame is shortened. When the weight is hung from the bolt compression is reduced and the frame and bolt are elongated. The division of load between the bolt and the frame is statically indeterminate, but it is evident

that the comparatively massive and rigid frame will get much more than the highly elastic spring balance, so the small increase in tension of the bolt would not be indicated by an ordinary spring balance. I substituted coiled springs for the wooden uprights of the frame and applied an initial tension of 6 lb. When a load of 6 lb. was added the spring balance showed 7½-lb. tension, and there was still compression in the springs. The effect of initial tension depends on the relative deformations of the tension member and the compressed mass." Mr. Henrici pointed out some practicable applications of the principle. When tension bars are built into the anchorage piers of cantilever bridges initial tension is given them to prevent pin play and vibration. Adjustable counters in pin-truss bridges and rod laterals are always given initial tension. The conclusion is that it is not safe to accept the general proposition that initial tension may be ignored. Each case should be examined separately.

Stiff-Leg Derrick Places 150-Ft. Trusses for Highway Bridge

By J. M. CHURCH WALKER
Redwood City, Calif.

A DIFFICULT bridge-erection problem was solved recently when a stiff-leg derrick was used to set completely assembled 150-ft. trusses on a California state highway project. The bridge, located in the district north of San Francisco on a state highway relocation,



Stiff-leg derrick sets bridge trusses

crosses two lines of railroad tracks on a sharp skew; and these, in turn, cross a county road at nearly a right angle. The specifications required that continual operation of both the railroad and the county road be permitted. After considering several expensive plans for temporary falsework, the contractor decided to assemble the trusses on the ground and place them with a stiff-leg derrick.

The derrick available was of the structural-steel type with a 46-ft. mast and a 90-ft. boom with legs 50 ft. long. It had been known to lift 53 tons with the boom out 40 ft. The trusses were erected in an upright position on a temporary wooden trestle on the opposite side of the track from the derrick. A temporary guy wire was fastened to the masthead and attached to a deadman on the hill, and the floor-system steel for the bridge, weighing approximately 85 tons, was piled on the back of the stiff-legs to help balance the weight of the trusses, estimated at 40 tons each. An agreement with railroad officials resulted in a six-hour period free from electric trains and a shutting off of the current on the third rail.

When ready for the first lift the top of the boom was 46 ft. out from the base of the mast. The intention was to boom-in to the proper line of the location as soon as the truss was clear of the railroad track in order to relieve stresses on the stiff-legs. This proved impossible, for, although the lift was easy, there was not sufficient power to move the boom. Therefore, it became necessary to lower the truss to the railroad tracks and make a second lift after setting the safety valve to boost up the pressure slightly. The first truss was set without further trouble in a total period of four hours, and the other truss followed immediately.

The work was done by Dyer Bros. Golden West Iron Works under the direction of George W. Dyer. The writer was engineer for Dyer Bros.

LETTERS TO THE EDITOR

K-Type Bracing for Long-Span Bridge Trusses

Sir—In the article "K-Type Bracing for Long-Span Bridge Trusses," in the April 2 issue of *Engineering News-Record*, the statement is made that the K-braced trusses in the approaches to the St. Lawrence River bridge at Quebec were the only ones of major importance in this country. I should like to offer a correction in that this type of bracing was used in the main trusses of the St. Lawrence River bridge at Quebec and also in the recently completed Montreal-South Shore bridge over the St. Lawrence River at Montreal, with a main span of 1,097 ft. Perhaps there have been other major structures using this type of bracing.

DONALD PATTERSON,
Resident Engineer,
Pennsylvania Department of Highways.

Kittanning, Pa.,
April 13, 1931.

Industry's Dependence on Its Trade Associations

Sir—I have read with much interest the editorial, "Crossroads of Industry," in your issue of April 2.

In my opinion you call attention accurately and forcibly to a very great danger which is facing industry at the present time. In times of stress like the present, management, even though both farsighted and conservative, is apt to adopt policies which under normal conditions would not be approved. It is therefore very fortunate that a paper with the influence of yours is able to see the danger and call attention to it.

If a person looks back over the history of industry in this country for the last eighteen months, he will find occasion for neither surprise nor criticism in the present efforts of industry to adjust itself to existing conditions. Manufacturers as well as other employers of labor have been continually exhorted, first, to reduce costs and profits that lower prices might be named on their products, and second, to do this without reducing wages. At the beginning of the period there were but few if any who were willing to contest the soundness of this policy, and therefore industry adopted this view and it assuredly has had a fair trial. As a result certain things have come about, it seems to me inevitably, and perhaps some of these have on the whole been profitable in the good that has been done. Other results have probably been unfortunate.

Industry naturally started in the direction of increasing efficiency, and, taking the country over, this has perhaps been carried to the *n*th degree. A good many extravagances and much needless waste have been eliminated, and in many other ways it has been found possible to reduce costs constructively. All of this is good. However, along with these constructive efforts and in order further to encourage buying, profits have been seriously cut, in many cases to the vanishing point and beyond. This is not constructive and needless to say cannot be continued indefinitely.

In spite of all this, we do not as yet seem to have reached

that for which we were striving and it is therefore not surprising that some are now willing to consider the adoption of policies that are not constructive. Among these is the matter of support of trade associations. This seems to me most unfortunate, and can only be explained by the efforts of industry to maintain the present scale of wages and at the same time continue to pay dividends to stockholders.

To go back again to the era of strictly individual endeavor seems to me unthinkable, and it is to be hoped that you and others will continue to speak frankly and forcibly to the end that the time and effort spent in building up our trade associations may not have gone for naught.

One other thing seems to stand out in our review of the last eighteen months, and that is the fact that most of those who have predicted as to the future and advised as to procedure have been wrong. Perhaps the theory of continually reducing costs and at the same time maintaining wage scales is not correct after all.

As a matter of fact, there are many now who have the feeling that the best and quickest way out is through some wage adjustment, although still having in mind the maintenance of the present American scale of living. Such a policy would enable the manufacturer to reduce his costs still further and thereby encourage buying and without being at all unfair to the wage earner. W. M. Wood,

Decatur, Ill.,
May 4, 1931.

President, Mississippi Valley Structural Steel Co.

Bridge Clearances

Sir—The editorial entitled "Light on Bridge Clearances," in the April 23 issue, is especially worthy of commendation. The best way to illustrate the absurdities of this matter of bridge clearances is to cite some actual cases. I think of two that came to my attention as director and chief engineer of the Ohio state highway department.

The 325-ft.-span steel bridge over the Sandusky River at Fort Seneca is the longest single-span bridge on the state system of highways. There was absolutely no good reason why it should have been made a single span, for there has been no navigation on the river at this point since the last Indian in his birch bark canoe paddled his way to Lake Erie more than a hundred years ago. I could stand on this bridge and throw a stone to a railroad bridge with two piers in the stream. The railroad built the bridge without consulting the war department. The Ohio state highway department asked for federal aid on its bridge and the U. S. Bureau of Public Works submitted the case to the war department, which ruled that no pier would be permitted in the stream. Whether this decision was reached on some fantastic idea of future navigation or in the memory of the Indian and his birch bark canoe, it is hard to say. It is certain, however, that the ridiculous ruling cost the State of Ohio and the federal government considerably more money than would have been expended on an economically designed structure.

Another case is the bridge completed last year at Napoleon, Ohio. The fact that the clearance on this bridge over the Maumee River had to be approved by the war department delayed construction for more than a year at the risk of collapse of the old structure and at a cost of at least $15,000 more than could possibly be justified. The waterway provided, after agreement with the district office of the war department, allowed 500 sq.ft. more than the structure then in existence, which had withstood the 1913 flood, the greatest on record. Following tentative decision by the district office of the war department, plans were started because of the long delay which had already occurred. What was the surprise of the Ohio highway officials when orders came from Washington that the bridge would have to be raised 3 ft. more.

On what finespun theories this arbitrary decision on clearance was based, no one so far as I know has been able to find out. There is no navigation on the Maumee River at this point except, as you state in your editorial, "launch loads of picnickers." Someone in Washington who perhaps never saw or heard of the Maumee River, and to whom Napoleon, Ohio, may have sounded like a dark horse presidential candidate, saw fit to increase the clearance approved by the district office, which was already extravagant.

The only consistency that I have been able to see about this matter of clearance requirements by the war department is to require a greater clearance than heretofore has ever existed in the locality concerned.

It seems to me that the war department claims authority in this respect over waterways which cannot by any stretch of imagination be considered as navigable. The arbitrary exercise of this authority without any responsibility for the cost which it entails is resulting in expensive delays and wanton waste of public funds.

There is absolutely nothing personal in my own ideas on this subject. I am not acquainted with a single person who has been connected with the handling of this business by the war department. There is something fundamentally wrong, not with the individuals but with the whole system. The authority which decides is too far removed from responsibility for expenditures and not able to learn the facts to make an intelligent decision. Harry J. Kirk,

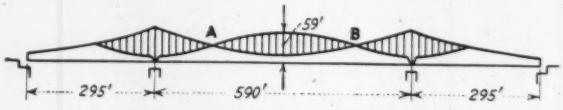
Washington, D. C.,
May 5, 1931.

Consulting Engineer.

Multiple-Span Suspension Bridges

Sir—Your issue of Jan. 15, 1931, presents a valuable article by E. F. Keuster on "Multiple-Span Suspension Bridges," and some supplementary information may be of interest.

The Montjean Bridge over the Loire, France, referred to by Mr. Keuster is of three-hinged type of braced-chain suspension bridge. The hinges over the towers are placed on rollers and connected by tie cables. The type of the



Arched stiffening truss insures rigidity

Montjean Bridge was dictated entirely by the requirements for the reconstruction of the old suspension bridge constructed in 1840 and designed for lighter loads. Because of the restraining effect of the tie cables and rigidity of the suspension frames the bending stresses in the towers were practically eliminated and it was possible to use the old masonry towers slightly reinforced.

The author properly stated the advantages of the tie cables. However, their practical value is limited by the span length and ratio of the static loads to the unbalanced moving loads and also temperature variation in the surrounding atmosphere.

Rigidity of suspension bridges may be increased by introducing arch members in the stiffening trusses. Deflection of the suspension bridge with arched member *AB* (see illustration), as computed by Prof. G. Kriwoschein (*Die Bautechnik*, Nov. 8, 1929), is about half that of a similar bridge without arch members. Moreover, in the first case less material was used. A. A. Eremin,

Sacramento, Calif.,
April 30, 1931.

Assistant Design Engineer, Bridge Department, State Highway Commission.

Flood Protection at Port Arthur —Correction

Sir—On p. 489 of your issue of March 19, 1931, in the article on "Flood Protection at Port Arthur, Texas," by J. B. Converse, a reference is made to the *Engineering Record* of Sept. 30, 1913. This reference should be Sept. 20, 1913 (p. 325). It is thought this information is warranted by the fact that the article in question was not written by Prof. Fellenius but is a translation of his lecture and therefore cannot be found in the author index.

Denver, Colo.,
April 7, 1931.

Ellis E. Haring.

NEWS OF THE WEEK

Objection Withdrawn to Award of Boston Post Office Contract

ON RECEIPT of additional information from the treasury department, the comptroller general has withdrawn his objection to the award of the contract for the construction of the new Boston post office. In a previous ruling (see *Engineering News-Record*, April 23, p. 701) the comptroller general held that the $4,648,900 contract for the work was improperly awarded to the N. P. Severin Co., of Chicago, because treasury officials made substantial alterations in the specifications without readvertising for bids.

The additional information has not caused the comptroller general to change his mind as to the procedure involved in supplemental bidding, but because the contract has been signed he believes that matters have gone too far for the general accounting office to raise further objection. It was not stated in the original decision that the award to the Severin company was illegal. The comptroller general held only that the treasury officials, in negotiating with bidders after several alterations in the specifications, were not complying with the law requiring the proper advertising of government work.

The comptroller general still holds the opinion that the letting of public work in the manner followed in this case is unfair to bidders, militates against the interests of the United States and is out of harmony with the purposes of the controlling statutes. Moreover, he cannot understand how original plans can be justified as not unreasonably extravagant when a saving of $1,000,000 can be accomplished by the elimination of so-called non-essentials.

Construction of Center Section of New York's Sixth Ave. Subway to Proceed at Once

DELAY to the construction of the Sixth Ave. subway in New York City because of possibility of injury to the Catskill aqueduct lying directly below, announced in these pages last week, may not prevent proceeding with the construction of that portion of the line between 39th and 53d Sts. within the next few months.

Because of existing rapid transit lines, the character of rock to be encountered and the presence of the Catskill aqueduct (Manhattan and Brooklyn's principal source of water supply) under part of the proposed route, the construction of the Sixth Ave. four-track subway is conceded to be the most difficult yet encountered in the building of New York's underground transit system. A description of these difficulties was given in *Engineering News-Record* Jan. 22, 1931, p. 136. Existing transportation systems along the route from 8th St. to 53d St. include the double-track Hudson & Manhattan tubes from 9th to 33d St.; the Sixth Ave. elevated line along the entire route; the H. & M. underground terminal at 33d St., and crossings of three subway lines (at 34th, 41st and 42d Sts.).

After passing beneath Central Park, the Catskill aqueduct enters Sixth Ave. at 59th St. and continues under Sixth Ave. to 33d St.; thence under Broadway to lower Manhattan; and thence under the East River to Fort Greene Park, in Brooklyn. Between 53d and 41st Sts. the tunnel is circular, with an interior diameter of 14 ft. The invert is lined with from 21 in. to 23 in. of concrete, and the roof is lined with from 29 in. to 31 in. of concrete. The concrete is not reinforced. Between 41st and 33d Sts. the diameter of the tunnel is 13 ft., and the lining is the same as that of the tunnel to the north. The tunnel is under a hydrostatic head of 450 ft. and the roof is approximately 200 ft. below the street surface.

The board of transportation had called for bids on the construction of the north section of subway, between 43d and 53d Sts., to be opened May 19. In this section rock lies about 9 ft. below street surface and the box structure of the subway reaches a maximum depth of 60 ft. below street level near 45th St. Excavating for this portion will leave but 140 ft. of rock cover over the aqueduct.

Considerable apprehension was felt by the department of water supply, gas and electricity, especially by W. W. Brush, its chief engineer, over the possibility of serious leakage developing when the rock in the subway cut is taken out. The possibility would be further enhanced by blasting in the cut. Figuring the weight of rock alone, without arch action, a cover of 170 ft. is necessary to resist the pressure of the 450-ft. head on the tunnel. The rock is a seamy Manhattan schist.

A leak in the water tunnel serious enough to require shutting off the supply at 93d St., the nearest cutoff, would deprive much of Manhattan and most of Brooklyn of its water supply. Because of the seriousness of such a

(Continued on page 825)

Wide-Flange Sections Made Interchangeable by Three Rolling Mills

NEW handbooks published this week by the Bethlehem Steel Co., and the Carnegie Steel Co. and the Illinois Steel Co., subsidiaries of the U. S. Steel Corp., reveal a high degree of standardization in the list of wide-flange structural steel shapes offered by the several mills. Virtually a new series of sections is announced, for each company has consolidated and simplified the list that it has heretofore offered. Previously only Carnegie rolled wide sections with parallel flanges. The new mill at South Chicago now permits Illinois to add these popular sections to its list and Bethlehem has substituted the parallel-flange type for its sloping flange column sections (14-, 12- and 10-in. sizes).

Standardization Discussed Two Years

Discussion of standardization of wide-flange sections was begun about two years ago, following settlement of the patent suit brought by Bethlehem against the United States Steel Corp. A joint committee was formed, but the first efforts failed. The present standardization was carried out separately by the two companies, with only unofficial understanding but with the common objective of reducing the number of sections offered and of eliminating overlapping groups. The Carnegie and Illinois handbooks are abridged editions of the well-known Pocket Companion. In addition to data pertaining to the CB series, information is also given covering the more commonly rolled sections, including those used in car and ship building. A new size of book and a new style of type have been selected in order to make the book more practicable, convenient and legible. The Bethlehem handbook, known as Catalog S-40, supersedes previous catalogs S-27, S-34 and S-39, and contains all of the design data that were included in the previous editions.

Extent of Standardization

Detailed examination of the new Bethlehem and Steel Corporation shape books shows that the wide-flange column sections of all three companies are strictly identical, all having parallel flanges, the same depths, the same web thicknesses, the same weights. Throughout the list of beams, with the exception of those between 21- and 28-in. depths, all sections offered by the three companies have the same weight, depth, web thickness and average flange thickness. The Carnegie and Illinois beam sections continue to have parallel flanges, while Bethlehem adheres to the slight taper on the inside of the flange.

This taper results in a slightly lower moment of inertia for the Bethlehem sections (such as 1,503.6, compared with 1,506.6 for the 18-in. 86-lb. sections), but for all practical purposes the beams may be considered equal in strength to the CB sections. For beams between 21- and 28-in. depths, the two books do not show complete standardization. The Steel Corporation retains its 21-, 24- and 27-in. sizes and has added a 20-in. section with three widths of flanges. Bethlehem retains its 22-, 24-, 26- and 28-in. sizes. Thus 21- and 27-in. beams are available in CB sections only, and 22-, 26- and 28-in. beams in Bethlehem sections only.

All of the new column sections have constant internal depth. The constant-external-depth sections in 12- and 14-in. sizes put out by the Carnegie Steel Co. some years ago is discontinued. Sections with constant external depth sold at a premium of approximately $1 per ton because of increased rolling costs. The constant-internal-depth characteristic will remove this extra cost and it is believed will provide a more advantageous section because it will promote the facility with which girder-column connections are made. Variations in external dimensions of sections at column splices may be easily and simply overcome by the use of filler plates. The accompanying table lists the new sections of the three companies in detail.

Old Sections Discontinued

These new wide-flange sections will be available after July 1, 1931, and the old series will be discontinued by all three companies. It is therefore important that customers desiring the old sections and weights enter their orders as far in advance of July 1 as practicable. After July 1 orders for the old sections will be filled from stock, if possible, and if not, will have to be changed to conform to the new series.

WIDE-FLANGE STRUCTURAL SHAPES
1931 SERIES

Rolled by Bethlehem, Carnegie and Illinois

Size	Weights
36x16½	300, 280, 260, 250, **240**, 230
36x12	192, 176, 167, **158**, 150
33x15¾	260, 240, 220, 210, **200**
33x11½	152, 141, 132, **125**
30x15	240, 220, 200, 190, **180**
30x10½	131, 122, **115**, 108
24x14	160, 150(*a*), 140, **130**
24x12	120, 110, **100**
24x10	93, **85**
24x9	81, **74**, 70
20x12	146, 135, **125**, 115
20x9	98, 88, **80**, 74
20x8	65, 60, **55**
18x11¾	99, 92, **86**, 80
18x8¾	77, **70**, 64
18x7½	57, 52, 49, **47**
16x12(*b*)	90, 83, **76**
16x8⅛	68, 63, **58**
16x7½	50, 45, **40**, 37
15x11	108, 99, **91**, 85
15x7½	72, 66, **60**, 55
15x6¾	49, 44, **39**, 35
14x16(*c*)	426, 412, 398, 384, 370, 356, 342, 328, 320, 314, 300, 287, 273, 264, 255, 246, 237, 228,
14x16(*c*)	219, 211, 202, 193, 184, 176, 167, 158, 150, **142**
14x14½(*c*)	153, 145, 136, 127, 119, 111, 103, 95, **87**
14x12(*c*)	84, **78**
14x10(*c*)	74, 68, **61**
14x8(*c*)	58, 53, 48, **43**
14x6¾	42, 37, **33**, 30
12x12(*c*)	190, 176, 169, 161, 154, **147**, 140, 133, 126, 120, 113, 106, 99, 92, 85, 79, 72, **65**
12x10(*c*)	64, 60(*d*), 58, 55(*d*), **53**
12x8(*c*)	50, 45, **40**
12x6½	36, 32, **28**, 25
10x10(*c*)	136, 130, 124, 118, 112, 106, 100, 95, 89, 83, 77, 72, 66, 60, 54, **49**
10x8(*c*)	45, **41**, 37, 33
10x5¾	29, 26, **23**, 21
9x5¼	23, **20**
8x8(*c*)	67, 62, 58, 53, 48, 44, 40, 35, 33, **31**
8x6½(*c*)	30, 27, **24**
8x5(*e*)	21, 19, **17**

Rolled by Bethlehem

Size	Weights
28x14¼	175, **166**, 156, 145
28x10	112, 104, **97**, 91, 85
26x14	171, 157, **145**
26x9¾	101, 91, **85**
22x13	116, **108**, 101
22x9¼	96, 89, **83**, 77
22x8⅜	73, 67, 62, **58**
10x9	45, **42**
6x10	88, 80, 73, 67, 60, 53, 46, **40**
6x6	40½, 30, 26½, 23, **20**
6x4	16, 14, **12**

Rolled by Carnegie and Illinois

Size	Weights
27x14	175, 166, 156, **145**
27x10	112, 104, 97, 91, **85**
21x13	116, 108, **101**
21x9	96, 89, 83, **77**
21x8¼	73, 67, 62, **58**
5¼x9¼	88, 80, 70, 60, 5(*d*), **40**
9x5¼(*f*)	23, **20**
8x8 (*f*)	37.7, 24.3, 32.6
8x5 (*f*)	21, 19, **17**
6x6 (*f*)	27.5, **25**, 22.5, **20**
5x5 (*f*)	**18.9**
4x4 (*f*)	**13.8**

Note—Weights in heavy type indicate sections whose dimensions are shown in the handbooks. Bethlehem sections are sloping flange type unless noted. Carnegie and Illinois sections are parallel flange unless noted.
(*a*) Bethlehem does not list this weight.
(*b*) Bethlehem flange width 11.5 in.
(*c*) Bethlehem sections of this size have parallel flanges.
(*d*) Carnegie and Illinois do not list this weight.
(*e*) Bethlehem flange width 5.25 in.
(*f*) Sloping flange sections.

New York Power Authority Named by Gov. Roosevelt

Announcement has been made by Gov. Roosevelt, of New York, of the personnel of the newly created Power Authority, charged with supervising construction, financing and operation of the projected hydro-electric development on the St. Lawrence River. The trustees, whose nomination is subject to confirmation by the state Senate when it meets in 1932, are:

Frank P. Walsh, of New York City, lawyer; James C. Bonbright, professor, Columbia University school of business; Fred Freestone, of Interlaken, master, State Grange; Morris Llewellyn Cooke, of Philadelphia, engineer; Delos Cosgrove, of Watertown, lawyer. The nominations include none of the members of the St. Lawrence Power Development Commission, which made the preliminary survey and drafted the bill creating the Power Authority.

Mr. Cooke, the only engineer appointed, is a consulting engineer in Philadelphia and was director of public works in that city from 1911 to 1915. From 1923 to 1925 he served as director of the Giant Power Survey of Pennsylvania.

The powers and duties of the Authority were outlined in *Engineering News-Record*, Jan. 8, 1931, p. 85, and April 30, 1931, p. 743.

Two Dams Fail in Georgia

Failure of a small privately owned dam on Beaver Creek in Georgia on May 5 released a flood of water which caused the overtopping and subsequent failure of the Harrison dam of the Georgia Power Co. a mile above Montezuma, Ga. The combined floods from the two reservoirs washed out a trestle on the Atlanta, Birmingham & Coast R.R., causing the wreck of a freight train, and flooded the main street of Montezuma to a depth of about a foot. The power company's dam, long unused, was an earth embankment about 10 ft. high. A section of the dam about 200 ft. long was washed away.

Loveland-Byllesby Offer to Buy Golden Gate Bridge Bonds

A proposal has been made to purchase the $35,000,000 bonds of the Golden Gate Bridge and Highway District and to construct the proposed Golden Gate bridge by the B-L Engineering Co., Ltd., San Francisco, Calif., recently organized by the H. M. Byllesby Co. and Loveland & Co., Ltd. The offer provides that the completed bridge will be turned over to the district in four years without any other compensation than that accruing from the sale of the bonds. The offer has been referred to the building committee of the Golden Gate Bridge and Highway District, and on May 20 this committee will make a definite report on the advisability of accepting this proposition.

A.G.C. Proposes Blue Book to Valuate Used Equipment

The creation of a schedule of valuation of used construction equipment for purposes of resale, similar to the automobile Blue Book, received a definite impetus at the Associated General Contractors board meeting in Washington last week with the appointment of a joint committee, representing the A.G.C. and the Associated Equipment Distributors, to make a tentative report on the subject. The Associated Equipment Distributors are affiliated with the A.G.C. Many leading manufacturers of construction equipment have indorsed the idea of a valuation schedule in answer to inquiries from the A.G.C. At present there is no standard upon which trade-in value of used equipment can be based, which is an unsatisfactory condition, according to both manufacturers and distributors. William Ogden, of the A.G.C., and A. C. Blaisdell, secretary of the Associated Equipment Distributors, head the committee.

New York Building Congress Celebrates 10th Anniversary

The tenth anniversary of the New York Building Congress was celebrated at its regular monthly meeting on May 12. Robert D. Kohn, retiring president, outlined the activities and accomplishments of the congress since its founding, April 21, 1921. U. S. Senator Robert F. Wagner, of New York, spoke on unemployment insurance, discussing the bills on the subject introduced by him in the last Congress. Two of these bills, one calling for the collection of economic information on employment and another putting federal construction on an advance-planning basis, have become laws. Harris H. Murdock, New York architect, was elected president of the congress for the coming year. E. L. Strickland was retained as secretary, and B. D. Traitel was reelected treasurer. Vice-presidents elected include Daniel T. Webster, William Arthur Payne, J. J. Collins, W. O. Ludlow and Richard A. Wolf.

New York's Sixth Ave. Subway

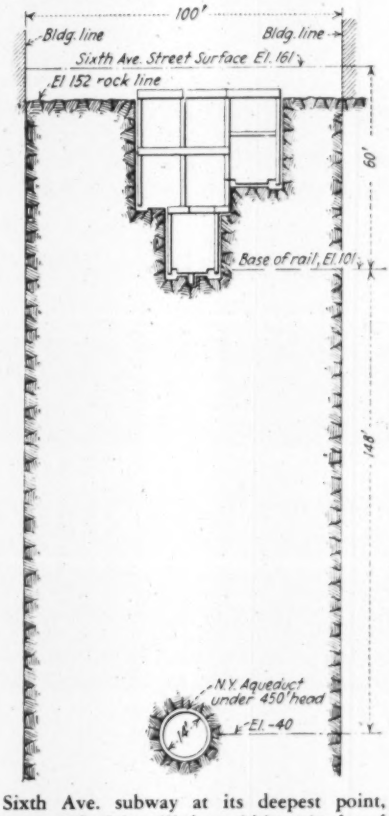
(Continued from page 823)

situation, Mr. Brush requested that work on the north end of the subway line be delayed until the new water tunnel now under construction through the Bronx, Queens and Brooklyn is completed and connected with the water tunnel that now supplies Manhattan. When this connection is made, some eighteen months or two years hence, the distribution system below 93d St. in Manhattan could be adequately supplied from the south should it be necessary to shut down the Manhattan tunnel between 93d St. and Madison Square.

Because of the shallower depth of the subway construction and the smaller amount of rock to be removed, construction in the section between 39th and 33d Sts. is not considered likely to endanger the aqueduct, and therefore the work will probably not be postponed.

The work north of 39th St. will probably be advertised about six months before the completion of the present tunnel, east of the East River, as a period of six months would elapse after the advertising of a contract before the contractor would reach any depth which would imperil the aqueduct.

The work south of 28th St. will be advertised at such times as necessary to coordinate the completion of this portion of the line with the completion of the remainder to the north.



Sixth Ave. subway at its deepest point, near 45th St., will be within 140 ft. of existing Catskill aqueduct; its construction will endanger the aqueduct service. The sketch does not show the elevated railroad structure, which carries a two-track line directly over the street.

Cooperation and Selling Construction Service Main Topics at A.G.C. Meeting

EIGHTY executives, secretaries and members of the Associated General Contractors of America met in Washington May 8 and 9 in a session devoted largely to discussions of cooperation with other elements of the construction field and to selling construction service. The program was a departure from the usual spring and fall board meetings held by the organization. The first day was given over to matters directly concerning the A.G.C., but the second day's program consisted of the presentation of seventeen topics of interest to contractors in general, not tied up with routine matters of the A.G.C.

Selling Construction

Three talks at a banquet held Friday evening were devoted to selling construction service. These were given by Truman Morgan, president, F. W. Dodge Corp.; W. T. Chevalier, publishing director, *Engineering News-Record*; and A. P. Greensfelder, president of the A.G.C. Col. Chevalier described construction service as the function of transforming liquid capital into fixed and useful service for the public. To sell such service, he declared, it was necessary first to determine a market, then study the buying habits of that market, determine effective channels through which selling can be done, and lastly, establish an effective appeal to that market. The approach to the buyer must be made on his interests, not on that of the seller. Col. Chevalier went on to say that there is no construction industry, considered as such. The construction field is made up of several component parts: the financier, designer, surety interests, material and equipment suppliers, labor and the constructor. Of all these, he said, the constructor is the logical element to take the leadership of construction and organize the various elements into an industry. Local leadership comes first, then national, he declared.

President Greensfelder outlined the origin and development of the A.G.C. Robert D. Kohn, president, American Institute of Architects, told of the New York Building Congress, now ten years old, and urged the formation of similar organizations throughout the country. He pointed out that the building congress was a most effective way to coordinate the various elements interested in building construction.

Cooperation

There are 37 committees having 500 members in the A.G.C. organization. Twenty-eight of these committees, almost all recently formed, are concerned directly with cooperation with other interests in the construction field. Contact with architects, federal departments, highway officials, inland and coastal waterways, surety companies, railroads, municipalities, industries, bankers and public utilities are maintained through committees. Home building, contractors' licensing, lien laws, research and construction methods are other items covered by committees.

The recently enacted Davis-Bacon bill, requiring payment of prevailing wages on federal building work, brought forth considerable comment and discussion. Two amendments to the bill are proposed by the A.G.C., the one to be pushed to be decided upon by a committee. One of the amendments would have the prevailing wages stated in the specifications or in the call for bids; the other would do this and in addition provide for protection to the contractor in case wages went up during the life of the contract, the government assuming the extra cost of labor and, likewise, the government would receive the benefit if wages dropped in a similar period. It was pointed out that the Davis-Bacon bill has already been interpreted to apply not only to the contractor's forces but to all employees of firms furnishing or making materials entering into the work. It was also revealed that at present the bill carries no penalty.

A report by S. M. Williams, manager, Bureau of Contract Information, shows that the bureau is continuing its successful performance. To date 4,200 reports of individual contractors have been placed on file. The information service of the bureau has been extended to manufacturers and materials dealers. More than 5,000 architects are cooperating with the bureau as the result of an indorsement by the American Institute of Architects.

O. W. Rosenthal, president, National Association of Building Trades Employers, outlined the plan for construction investment trusts. The plan is to issue shares in the investment trusts, the shares representing certificates of interest in thousands of buildings. Control of construction from within would be the result, and longer amortization of building loans, much needed, would follow. He declared the public is entitled to the protection of a sound investment trust and that the wide diversification of types of construction represented by the investment trust would make the shares a sound investment.

Col. W. A. Starrett, vice-president of the A.G.C., begged construction not to sell itself short. This is what is done when general contractors submit bids containing prices of sub-trades below the figures submitted by subcontractors, depending upon beating down the subs to the expected price after the contract is secured. He says the general contractors are fooling themselves only, the subcontractors submitting first figures high enough to allow for reduction upon later demand.

Standards in sizes of contractors' pumps were adopted. These standards are given in the new equipment section of this issue.

Milwaukee, Wis., was chosen as the site of the thirteenth annual convention of the A.G.C., to be held next January.

Local Cement Prices Drop 6 to 29 Per Cent in Last Two Months

THE cement price war, fiercest in the Middle West, is extending. In 30 of 42 cities in 28 states reporting on the current situation prices have slumped 10 to 41 per cent from those of March 1, 1930, and 6 to 29 per cent from those of only two months ago.

In only a dozen cities is there quiet, mostly the quiet of stagnation. There have been no price movements in a year or more in Charleston, Salt Lake City, Boise, San Diego and the two Portlands. Comparatively small declines are reported as follows: Trenton, 7 per cent; Duluth, Richmond, New Orleans, 6 per cent; Madison, 8 per cent. These are the exceptions. The accompanying tabulation shows the break to be general throughout the country, and the paragraphs in small type give the details.

The majority of these reductions in price-to-users have taken place quite recently, within a month or two months at most. Mill prices, however, have been falling steadily during the last six months. The drop in the average of the formal published quotations at sixteen to eighteen leading mills indicates the extent of the decrease.

		Per Cent Drop			Per Cent Drop
Nov. 1	$1.82	0	Mar. 1	$1.58	6½
Dec. 1	1.75	4	Apr. 1	1.55	2
Jan. 1	1.76	+½	May 1	1.44	7
Feb. 1	1.69	4			
6 months, drop				$0.38	21

Since May 1 there have been two important mill decreases, one at the Penn-Dixie plant at Portland Point, N. Y., amounting to 31c., and a 10c. drop at the Standard plant at Painesville, Ohio. Ten days before this there had been a 10c. cut at the latter plant.

The capacity of the cement industry totals 266,000,000 bbl., or one-third more than consumption in the maximum year 1928. Present operations amount to 37 per cent of capacity, compared with 52 per cent a year ago. One of the original causes of the break was full capacity operation by the smaller mills, in order to keep down costs. To move the production prices were cut. While these mills individually would have small influence, collectively they have been an important factor. For example, a group of these in the East comprising ten companies has a capacity of 26 million barrels. Capacities of the five big cement companies of the country in millions of barrels are Universal Atlas 36; Lehigh, 23; International, 14; Alpha, 12; Penn-Dixie, 10.

Meetings in progress this week are expected to bring agreements among manufacturers that will alleviate the tension and return the industry to a normal footing. If not, it is predicted that prices will go lower in the East. In the West, with 81c. per barrel and 70c. in sight, prices are close to cost.

Louisville—Price reductions started Feb. 2, and there have been four.

Akron—Heavy accumulation of stocks resulted in a general price war, which is now on. It is expected that when it is over prices will be stabilized at a level checking with that of all commodities. Price in paper sacks was $2.22 in March, 1930; $1.90 in March, 1931, and $1.70 since April 1.

Canton—Diamond Portland Cement Co. at Middlebranch, the principal producer in this area, has been shut down, but will resume full operation May 15. Dealers claim $2.10 is bottom. Consumption has been increasing slowly in the last 30 days.

Kansas City—Present price $1.45 after drop of 28 per cent.

Lincoln—Price of $1.43 is based on 90c. per barrel at mill for bulk. Some Kansas mills are shipping at 60c.

Albany—The 10 per cent discount has not been deducted from the prices in the table. State recently contracted for cement in this vicinity at $1.85.

Tallabassee—A year ago a 20c. cash discount was allowed, against a 10c. discount this year.

Concord, N. H.—Prices low due to small demand by farms as well as for construction.

Milwaukee—Cash discount of 5 per cent has been subtracted from prices in table. During summer of 1930 price was $2.32; drop on Feb. 18, 1931, to $2.20, and on March 28 to present unstable price of $1.62.

Pueblo—Cement is sold only by the bag (paper), and 75c. per bag has been the price for several months, compared with 90c. a year ago.

St. Louis—Price war among manufacturers and dealers on in this district since September. Until late that month prices had been stable at $1.95 f.o.b. and $2.45 delivered. Then came the first break, to $2.15 for truck deliveries; but for several weeks the f.o.b. price remained $1.95, the differential being 20c. instead of the normal 50c. In late December this price was cut, restoring the old differential. Present quotations are $1.44@$1.54 in cloth and $1.59@$1.69 in paper. The price war in cement continues here, and there is another one in sand, gravel and crushed stone.

Duluth—The Universal mill here bases its prices on the Mason City, Iowa, mill of Lehigh, price at the latter being $1.10.

Birmingham—March production and shipments were respectively 26.7 and 18.7 per cent below the figures for a year ago; but in the last month production has increased 16 per cent and business has been much better.

Dayton—No longer a uniform price among dealers. There is price cutting, and lower prices are expected.

Montgomery—Prices $1.85 in cloth and $2 in paper, same for last three months, with no change expected.

Richmond—Price is $3.10 retail, $2.26 wholesale or in carload lots; state is paying $2, and factory price is $1. Price before the break was $2.72.

Salt Lake City—No price change in more than a year and the market is stagnant due to drop in heavy construction and the predominant use of oil processing surface instead of concrete paving. Utah Portland Cement Co. plant closed since Oct. 1, 1930; Devil Slide plant of Union Portland Cement Co. on half time; Brigham City plant of Utah-Idaho Cement Co. operating occasionally.

San Antonio—Recent reduction of 17c. due to an out-of-town manufacturer taking contract to furnish cement for Randolph Field construction jobs.

San Diego—For more than a year prices have been $2.76 in cloth and $2.80 in paper, subject to discount of 5 per cent if payment is made in two installments, on 10th and 25th of month after purchase. No price changes foreseen.

Toledo—Price is $1.61 delivered for 50 bbl. or more, and $2.25 for 20@50 bbl.

Chicago—Prices are for truck delivery and 2 per cent is allowed for cash. Only activity is in concrete paving by state, county and city; surrounding towns paved to requirements two years ago.

Minneapolis—Dealers claim the price is stabilized at $2.15. City pays $1.80 f.o.b., compared with $2.23 in January. State highway department at St. Paul is paying 90c. at mill.

CEMENT DELIVERED NET IN 42 CITIES

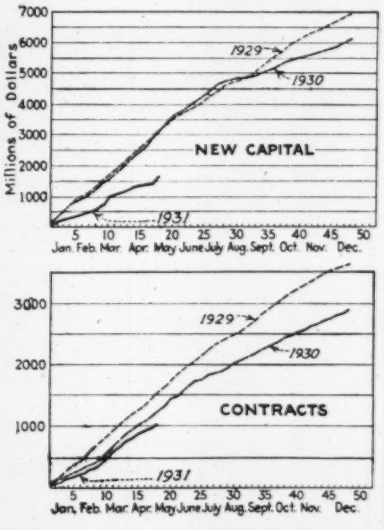
	1930, Mar. 1	1931, Mar. 1	1931, Apr. 1	1931, May 1	Per Cent Drop From March 1 1930	Per Cent Drop From March 1 1931
Akron	$2.37	$2.05	$1.85	$1.85	22	10
Albany	2.20	2.13	1.93	1.58	28	26
Amarillo	2.54	2.35	1.95	1.86	27	21
Birmingham	2.05	1.46	1.46	1.46	29	..
Boise	...	3.18	3.18	3.12	..	2
Canton	2.70	2.50	2.10	2.10	22	16
Charleston	2.52	2.52	2.52	2.52	..	..
Chicago	1.85	2.10	2.10	1.95	+5	7
Concord	2.59	2.15	2.10	2.00	23	7
Dayton	2.50	2.30	...	2.00	20	13
Duluth	1.99	1.976	1.976	1.8715	6	5
Evansville	2.85	2.20	2.20	1.88	25	15
Fort Worth	2.15	2.15	2.08	1.88	13	10
Indianapolis	...	2.40	2.30	2.10	..	13
Kansas City	2.02	1.45	1.45	1.45	28	..
Lincoln	2.29	2.02	1.61	1.43	37	29
Louisville	2.52	2.32	1.86	1.86	26	20
Madison	2.40	2.50	2.20	2.20	8	..
Milwaukee	2.20	2.08	1.62	1.62	26	22
Minneapolis	2.50	2.15	2.15	2.15	14	..
Montgomery	2.09	1.85	1.85	1.85	12	..
New Orleans	2.07	2.01	2.01	1.95	6	3
Oklahoma City	2.10	1.78	1.63	1.54	27	14
Oswego	3.35	3.20	3.20	3.00	11	6
Peoria	2.02	1.88	1.68	1.54	24	18
Pittsburgh	1.95	2.15	2.50	1.96	..	9
Portland, Me.	2.85	2.80	2.85	2.80	2	..
Portland, Ore.	2.50	2.50	2.50	2.50	..	..
Pueblo	3.60	3.00	3.00	3.00	17	..
Richmond	2.41	2.40	2.26	2.26	6	6
St. Louis	2.45	2.15	2.15	2.10	14	2
Salt Lake City	2.81	2.81	2.81	2.81	..	..
San Antonio	1.85	2.20	2.20	2.03	+10	8
San Diego	2.76	2.76	2.76	2.76	..	..
Seattle	2.30	1.70	1.70	1.70	26	..
Sioux City	2.30	1.71	1.71	1.56	32	9
Syracuse	2.10	2.01	1.96	1.62	41	19
Tallahassee	2.75	2.46	2.46	2.46	11	..
Toledo	2.41	1.81	1.61	1.61	33	11
Trenton	2.80	2.80	2.60	2.60	7	7
Tulsa	2.30	1.89	1.58	1.48	30	18
Wheeling	2.15	2.15	2.15	1.75	19	19
Average 42 cities	$2.30	$2.24	$2.12	$2.04	16	9
Toronto	2.40	2.42*	2.42*	2.42*		

*Paper bags.

Capital and Contracts

This week's new capital issues totaled 27 millions private and 29 public. Principal issues were $15,547,000 Westchester County 3½s and 3¾s for park, sewer, hospital, jail and highway; $10,400,000 San Francisco city and county 4½s for water, playground, memorial hall, parks and paving. Cumulative figures are 861 millions private and 856 public, a total of 1,717, compared with 3,164 millions to May 8, 1930, a drop of 46 per cent.

Contract total for the week ended May 7 was 59 millions. Cumulative figures are 1,039 millions, compared with 1,264 last year, a drop of 18 per cent.



WASHINGTON NOTES

By PAUL WOOTON
Washington Correspondent

No Cut Likely in Flood-Control Item—Secretary Hurley Outlines His Stand on Bridge Clearances

FEAR that there will be a reduction in the flood-control item in the new budget has been allayed by the secretary of war, who states that there will be no reduction in the non-military activities of his department. Realizing that the treasury is facing an $800,000,000 deficit, those interested in flood-control and river and harbor work feared that these large items in the budget would be cut, but as a result of Secretary Hurley's reassuring statement the general feeling now is that the budget will carry as usual $35,000,000 for flood control.

Even the threat of a tax increase apparently has not shaken the President from his determination to provide the interior of the country with cheap water transportation. Secretary Hurley, in a public statement, specifically declares that there will be no reduction in that item. This means that the usual $55,000,000 will be proposed for that work. The secretary emphasizes the necessity for completing the Lakes-to-Gulf waterway and the waterway to Kansas City.

The deficit, however, has had the effect of increasing the desire of the administration to avoid the flood-control diversion through the Boeuf basin.

Bridge Clearances

While the war department appreciates the needs of land transportation, it must confine itself to the requirements of marine navigation in approving bridge clearances. This was stated recently by Secretary of War Hurley in connection with the proposed 57th St. bridge in New York City. Mr. Hurley conceded that by requiring high clearances over important rivers and streams the war department is sometimes forced to impose a burden on commerce and transportation. Whatever importance a proposed bridge may have for communication lines across a river, Mr. Hurley believes that the war department cannot under the basic law balance the needs of land transportation against those of waterborne commerce.

The latest proposals concerning clearances for the 57th St. bridge are now before Major Gen. Lytle Brown, Chief of Engineers, and he is expected to make known his decision soon.

Barge Service on the Illinois

Dredging on the Illinois River has progressed so far that officials of the Inland Waterways Corporation now plan to begin barge service to Peoria on June 15 instead of on July 1. Although the Illinois project calls for 9-ft. depth, service on the river will be opened with a depth of 6 ft. For this reason it will be necessary to start the service with shallow-draft towboats from the upper Mississippi division. The barges, however, will go through to New Orleans, and will be transferred to more powerful and deeper draft towboats at St. Louis. A modern rail and waterway terminal already has been built at Peoria.

Airport Drainage and Surfacing

After studying a hundred representative airports the committee on airport drainage and surfacing, headed by Harry H. Blee, of the aeronautics branch of the commerce department, is preparing to make its report. The committee was organized about a year ago and includes in its membership representatives of the American Engineering Council, the American Road Builders' Association and the aeronautics branch. Outstanding problems that have been given consideration include landing area requirements, grading, drainage, surfacing, runways, impact, surface textures, transition strips, and turf and treatment of soils to increase stability.

Chicago City Engineer Suspended

The first action taken by the new Chicago administration in investigating the promotional examinations held during the Thompson administration was to suspend the city engineer, Loran D. Gayton, pending a review of the examination paper on which he had been promoted to the position. Immediately after the recent election of A. J. Cermak as mayor Mr. Gayton was given a month's vacation. The work of the city engineer's office is temporarily under the direction of M. B. Reynolds, assistant city engineer.

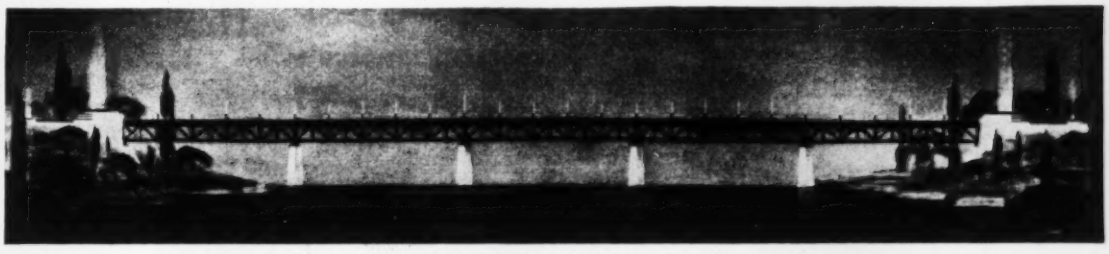
Prizes Awarded for Best Examples of Bridge Design

For the most esthetic design of a bridge in steel, the American Institute of Steel Construction has awarded five prizes totaling $1,200. The prize winners were selected from some 150 students of engineering and of architecture in the various colleges and universities of the United States and Canada.

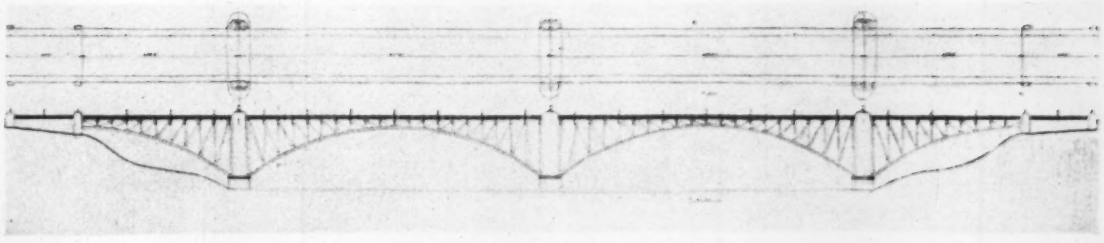
The first prize, $500, for the best design by a student of architecture went to R. F. Weber, of Atelier Adams Nelson, Chicago. The second prize, $250, was awarded to Glenn E. Crippen, of Iowa State College, and the third prize, $100, went to Lester W. Casey, of Iowa State College.

The jury decided to withhold the first prize to the group that contested for the best design by an engineering student. The second prize in this group, $250, was awarded to Jeremiah C. Iandolo, of the University of Pennsylvania, and the third prize, $100, went to Covert Robertson, of the University of Michigan.

The jury consisted of Ralph Modjeski, consulting engineer; Shortridge Hardesty, consulting engineer; H. H. Murdock, architect; Clinton Mackenzie, architect, and F. E. Schmitt, editor of *Engineering News-Record*.



First prize for bridge design, architectural students' group



Second prize for bridge design, engineering students' group

Brief News

IMMEDIATE CONSTRUCTION of a 30,000,000-gal. water reservoir in Battlefield Park has been decided upon by the city council of Quebec, Canada. The reservoir will be 780 ft. long, 310 ft. wide, and will be completely covered. The cost of the project is estimated at $1,000,000.

GRADING on the St. Walburg-Bonnyville branch of the Canadian National Railways in western Canada will be started soon and it is expected 600 men will be employed. Completion of the 100-mile gap will give the railway an important through line north of the Saskatchewan River from North Battleford to Edmonton.

WITH THE AWARD of a $52,486 hangar construction contract the total expenditure on improvements for the new municipal airport at Sacramento, Calif., has been raised to $150,000. In addition to the municipal hangar building just authorized, a $35,000 hangar has just been completed for the use of Boeing Air Lines, and a site has been donated for a hangar in which to house the three state planes provided for in a bill pending before the legislature.

CANADA'S CANAL SYSTEM has cost the country $300,397,493, which includes $20,593,866 of capital expenditure made by the imperial government prior to confederation, according to a statement made by the minister of railways and canals in the Canadian House of Commons recently. There are 75.92 miles of primary and 433.48 miles of secondary canals. Tolls were abolished in 1903, but revenues are secured from elevator fees, hydraulic and other rentals, and wharfage. Total revenue from all sources up to the end of March, 1930, was $27,139,532. The revenues for the fiscal year ended March, 1930, totaled $1,043,647.

COSTS AND CONTRACTS

E. N.-R. Index Numbers

Cost				Volume		
May 1,	1931	189.33	April,	1931	289
Apr. 1,	1931	191.63	March,	1931	278
May 1,	1930	205.86	April,	1930	320
Average,	1930	202.85	Average,	1930	260
Average,	1929	207.02	Average,	1929	317
1913		100.00	1913		100

This Week's Contracts

Heavy construction contracts, reported by *Engineering News-Record* in the week of May 14, with some comparisons, total as follows:

(In Thousands of Dollars)

	May 14, 1931	Average of Last Four Weeks 1931	1930
Buildings:			
Industrial	$3,261	$2,383	$7,615
Other	19,277	16,193	38,942
Streets and roads..	24,895	18,691	17,729
Other eng. constr..	11,663	20,279	19,949
Total	$59,096	$57,547	$83,236
Total, all classes, Jan. 1 to May 14:			
1931			$1,098,454
1930			1,381,760

Personal Notes

GEORGE S. BARTLETT, of Chicago, special representative of the Universal Atlas Cement Co., has been retired under the 70-year retirement rule of the United States Steel Corp. and has been elected assistant to Frank H. Smith, chairman of the Portland Cement Association.

W. CHESTER SMITH, city engineer of Oshawa, Ont., Canada, for the last ten years, has resigned to accept a position with the Cooksville Brick Co., of Toronto.

ROBERT S. STANSFIELD, JR., for the past four years inspector and laboratory engineer with the Associated Factory Mutual Fire Insurance Companies, has been appointed to the field engineering staff of the National Fire Protection Association.

B. J. ORNBURN, designing engineer for the Montana state highway commission, has been appointed bridge engineer. Mr. Ornburn is a graduate of the University of Missouri and started his career as a bridge engineer with the Missouri state highway commission. Prior to going to Montana, he was with Ash-Howard-Needles & Tammen, consulting bridge engineers in Kansas City, Mo.

GEORGE G. EARL and RALPH EARL, for many years engineers for the sewerage and water board of New Orleans, announce that they have organized the Earl Engineering Co., with offices in New Orleans, La.

EDWARD D. BOYER, technical service manager of the New York office of the Universal Atlas Cement Co., has announced his retirement from active business. Mr. Boyer joined the Atlas organization in 1902. He is a director and former president of the American Concrete Institute and a past-director of the American Society for Testing Materials, and has been for many years a member of the Portland Cement Association's technical problems committee.

J. F. COLEMAN, of New Orleans, has been appointed advisory engineer with the Richmond, Va., department of public works to assist the Richmond Port Commission in an $8,000,000 port and harbor development on the James River.

HENRY T. PORTER, chief engineer of the Bessemer & Lake Erie R.R. since 1898, has retired and is succeeded by FRANK R. LAYNG, assistant chief engineer, who has been with the road since 1900.

SOCIETY CALENDAR

AMERICAN SOCIETY OF CIVIL ENGINEERS, New York; summer meeting, Tacoma, Wash., July 8-10.

AMERICAN SOCIETY FOR TESTING MATERIALS, Philadelphia; 34th annual meeting, Chicago, June 22-26.

AMERICAN WATER WORKS ASSOCIATION, New York; annual convention, Pittsburgh, Pa., May 25-29.

AMERICAN ROAD BUILDERS ASSOCIATION will hold its annual meeting in Washington, D. C., May 15-16.

NATIONAL CONFERENCE ON CITY PLANNING will hold its 23d annual meeting in Rochester, N. Y., June 22-24. Some of the subjects to be presented for discussion are: "Mass Transportation on the City Street," "The Relation of City Planning to Special Assessments," "Zoning Administration," "Is City Planning Effectively Controlling City Growth in the United States"? "Master Plans and Official Maps—the Basis of Effective Planning" and "The Avoidance of Blight in Areas Adjacent to Traffic Thoroughfares." Fladel Shurtteff, 130 East 33d St., New York City, is secretary.

SYRACUSE SECTION, American Society of Civil Engineers, has elected the following officers: president, Marshall B. Palmer, engineer of water supply in the division of engineering; first vice-president, Warren A. Lyons; second vice-president, H. N. Cole; secretary-treasurer, Earl F. O'Brien.

WESTERN SOCIETY OF ENGINEERS has elected the following officers for 1931-32: president, Frank D. Chase; vice-presidents, D. J. Brumley, Harry B. Gear and C. C. Whittier; treasurer, Leigh S. Keith.

Obituary

IRVING PORTER CHURCH, professor emeritus of civil engineering at Cornell University, died on May 7 after an illness of about two years. He was 80 years old. Professor Church was recognized as an expert in civil engineering and had been called "the father of mechanics" because of his text book "Mechanics of Engineering," which is still cited as an authority, though published 30 years ago. Prof. Church had been on the faculty of Cornell since 1876. In 1929 he received the Benjamin G. Lamme gold medal from the Society for the Promotion of Engineering Education "for accomplishment in technical teaching and actual advancement of the art of technical training."

CHARLES DAY, chairman of the board of Day & Zimmermann, Inc., engineers, of Philadelphia, died on May 10. Mr. Day was born in Philadelphia in 1879 and was graduated in engineering from the University of Pennsylvania in 1899. Three years after his graduation he established the firm of Dodge & Day, specializing in management and construction work. In 1911 the firm became Day & Zimmermann, Inc., and Mr. Day was its president until 1926, when he became chairman of the board. He was an authority on the efficient equipment of industrial plants and the management of public service corporations.

FRANK HARRISON BAILEY, of Helena, Mont., died on April 29 at the age of 65. Mr. Bailey was born in Wellsboro, Pa., and after several years in construction work for railroads in the East he became, in 1908, chief engineer of the Bitter Root Valley Irrigation Co., with headquarters at Hamilton, Mont. In 1914 he went to Alaska as engineer for the Alaskan Engineering Commission on the construction of the government railroad. In 1919 he returned to Montana as bridge engineer with the state highway commission. Mr. Bailey was a member of the American Society of Civil Engineers.

Construction Equipment and Materials

A.G.C. Approves Pump Standards

Standardization of pumps used on construction work as regards sizes and general specifications has received the approval of the Associated General Contractors of America, which on May 8 adopted a set of "Contractors' Pump Standards" prepared by the Contractors Pump Manufacturers Bureau, Munsey Building, Washington, D. C., which will be adhered to by all members of the bureau. Two sizes of road pumps will be designated as R-80 and R-125. The former will displace 80 g.p.m. at 500-lb. pressure with an engine speed of not over 1,200 r.p.m. and 100 g.p.m. at 400 lb., engine speed not over 1,500 r.p.m. The latter will displace 125 g.p.m. at 320 lb., engine speed not to exceed 1,500 r.p.m. Three sizes of open-type suction diaphragm pumps will be designated as No. 3 single, No. 4 single and No. 4 double. General characteristics of these units are:

Size	Static Head (Ft.)	Displacement (Gal. Per Hour)	Motor (Hp.)
3 single	10	4,000	1½
	20	2,000	
4 single	10	8,000	2
	20	4,000	
4 double	10	12,000	3
	20	7,000	

Pumps shall be designed and manufactured to operate continuously at their rated capacities, and shall have a guaranteed capacity 10 per cent greater. A standard rating plate on each unit shall state its size, rating and the fact that it complies with A.G.C. standards

Wheel-Mounted Maintenance Grader

Designed and engineered throughout as a heavy-duty maintenance unit, the Caterpillar Auto Patrol, a wheel-mounted grader with scarifier, has been placed on the market by the Caterpillar Tractor Co., Peoria, Ill. Standard equipment includes pneumatic tires, four-speed transmission, power control for raising and lowering both scarifier and blade, swinging the circle and shifting the blade from side to side, and electric lighting equipment, including lights, generator and battery. The motor used in that used in the Caterpillar 20 tractor and is mounted in the main frame, behind the operator's seat. This location gives the operator clear vision, freedom from heat and fumes, and places proper weight on the rear tires to give maximum traction.

The machine weighs, without scarifier, 14,000 lb. and carries a standard blade 12 ft. long and 17½ in. high. This is mounted on a 49-in. circle of structural steel. The scarifying unit weighs 1,300 lb., is made of cast steel with eleven teeth and is controlled through a worm and gear connected with the power-control mechanism. The four speeds of the transmission are intended for use, respectively, for scarifying, normal maintenance work, surface maintenance work and for moving from job to job at a pseed of 10 m.p.h.

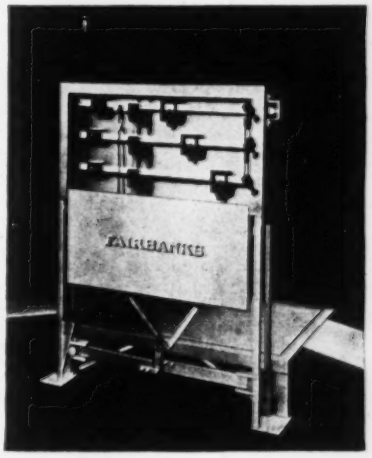
Front view of wheel-mounted maintenance grader

Phosphor Bronze Bridge Plates

Bearing, expansion and bed plates of cold-rolled Anaconda phosphor bronze for use in steel and concrete bridge construction are now being produced by the American Brass Co., 25 Broadway, New York City. Despite the fact that, in wrought form, the physical structure and characteristics of phosphor bronze give it a decided advantage over the cast variety, it is only recently that this material has been available for bridge work because of manufacturing limitations. Through the development of new rolling practice the company is now equipped to furnish bridge plates of cold-rolled phosphor bronze, which is produced by cold-working cast bronze to improve its physical structure and characteristics, in practically any gage or size. The process gives the metal a fine-grained and homogeneous structure with resulting high tensile strength, high elastic limit, high resistance to fatigue and a toughness equal to wrought iron. The material is entirely rustproof and resistant to corrosion. Its high bearing qualities make it particularly durable in withstanding wear by friction and abrasion. It is manufactured to meet the chemical and physical requirements of A.S.T.M. specifications, which have been adopted by 50 per cent of the state highway commissions of the United States. Bridge plates are furnished accurately sized to dimensions in any shape, with or without bolt holes, as specified.

Wheelbarrow Scale for Aggregates

To meet the growing demand on the part of construction engineers for measurement by weight instead of by volume in the mixing of concrete, Fairbanks, Morse & Co., Chicago, Ill., have developed a highly accurate, lightweight, sturdy scale for weighing wheelbarrow loads. All weighing can be done on the one scale, which is provided with a tare bar and two beams, one for sand and one for stone. The device meets specications prepared by the Associated General Contractors and adopted by the American Road Builders Association.



Wheelbarrow scale

This scale provides for an accurate scientific control of the mix and enables the contractor to meet rigid specifications without increasing the labor cost of mixing. It is made in two sizes, one of which has a 42x30-in. platform for weighing wheelbarrows and weighs complete only 275 lb. The other, with a 42x42 in. platform, is especially designed for weighing materials in carts or buggies; it weighs 320 lb. Both are of welded steel construction throughout and are carefully braced for strength.

Three scale beams are provided, the top one being a tare bar used to balance the weight of the empty wheelbarrows and the two lower, each graduated to 500 lb. at 2-lb. intervals, are for sand and stone. A new style springless "over-and-under" telltale device, carefully protected from dust and corrosion, is connected with the beams and so mounted that it can be swung to any angle to insure easy reading. Either the sand or the stone beam may be thrown into

(Continued on page 832)

Current Construction Unit Prices

Levee Work in New Orleans District

BIDS were received March 7, 1931, for 3,730,000 cu.yd. earthwork on Bedford-Bayou Vidal levee in the Second New Orleans District. The work is in three sections or lots, and unit prices are given of the lowest three bids and the averages of all the bids. The three lots were let to H. B. Blanks, Tallulah, as follow: 1, 15c. per cubic yard, $249,750; 2, new, 20c. per cubic yard, $340,000; 3, 18c. per cubic yard, $63,900.

	A	B	C	Average All Bids
Lot 1, new, 1,665,000 cu.yd.	$0.1424	$0.1435	$0.150	$0.1795
Lot 2, new, 1,700,000 cu.yd.	.1860	.1873	.192	.2500
Lot 2, enlarge alt., 1,189,000 cu.yd.	.2244	.2850	.310	.3220
Lot 3, new, 355,000 cu.yd.	.1800	.1873	.192	.2760

Concrete Bridge Over Schuylkill River, Reading, Pa.

BUTTONWOOD St. bridge across the Schuylkill River, at Reading, Pa., is a nine-span reinforced-concrete structure 765 ft. long. It will carry the street over the tracks of the Reading Company and of the Pennsylvania R.R., the Schuylkill Navigation Co. canal, the river, and over present and proposed tracks of the Union Canal branch of the Reading Company. The east approach is 288.5 ft. long and has two ramps. The west approach is 755 ft. long and passes under the Belt Line tracks of the Reading by means of a concrete-steel beam underpass bridge. Total length of the project is 1,808.5 ft. with a clear roadway of 42 ft. and two 9-ft. sidewalks. Each of the ramps adjacent to the east approach has a clear roadway of 20 ft. and one 8-ft. sidewalk.

All rail and street traffic must be maintained, including two tracks of the Schuylkill division of the Pennsylvania (to be centered over in one span); one track each of the Schuylkill & Lehigh branch and of the Union Canal branch of the Reading, and Belt Line traffic on a two-track trestle.

Concrete is of three classes: AA, 1:1½:3, for spiral columns over river arches and columns in underpass, including the 7-ft. supported arches up to the floor slab; A, 1:2:4, for arch ribs between skewbacks, upper parts of abutment piers, spandrel walls and posts, cross-girders, floor beams and slab, conduit slabs below sidewalks, rigid-frame girder spans above footings, including pier shafts, girders and floor slab, underpass retaining and wing walls above foundation piers, underpass floor slab, all cornices, coping, sidewalks and parapets; B, 1:3:5, for foundations of all piers, abutment piers and retaining walls, pier shafts and abutment piers. Concrete for abutment piers and piers 1 to 10 inclusive is class B up to specified elevation. The upper part is of class A concrete, but is built monolithically with the class B concrete below. Concrete for the four arch ribs of the three river spans is class A. Each rib is built in two main transverse sections and three transverse keys. Pier shafts for the rigid-frame construction at both ends of the river span, 1 to 4 and 7 to 10 inclusive, are of class A. Each shaft is built in a continuous operation from foundation course to spring line. The rigid-frame girders and adjacent floor slab are class A. The girders are cast in pairs continuously from end to end of the three spans, 172 ft., together with floor slab or coping.

All spiral reinforced columns in river arch construction

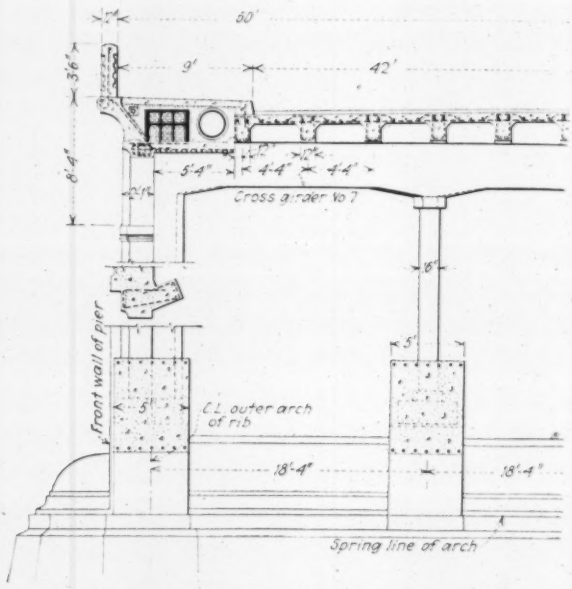


Fig. 2—Floor cross-section of arch span near haunch

are class AA concrete. Spandrel walls with adjacent cross-girder support walls and all cross-girders are of class A. The floor beam and slab construction over the river span is

	A	B	C	Average of 14 Bids
Lump sum bid	$416,000.00	$424,750.00	$432,900.00	$520,691.00
Sheet asphalt pavement wearing course 2½ in., per sq.yd.	1.65	1.25	1.50	1.78
Asphalt conc. wearing course, 2½ in., per sq.yd.	1.45	1.25	1.75	1.50
Rock asphalt wearing course, 2½ in., per sq.yd.	2.65	1.60	2.50	2.32
Foundation Concrete:				
In easterly approach walls or piers 1, 2, 3, per cu.yd.	18.00	12.00	11.90	13.17
In piers and abutment piers 4, 5, 6, 7, per cu.yd.	25.00	15.00	12.65	16.05
In piers 8, 9, 10, per cu.yd.	15.00	15.00	13.80	13.70
In 20 underpass piers, per cu.yd.	20.00	18.00	14.60	17.33
Concrete 1:3:5 for retaining walls above ground, per cu.yd.	15.00	12.00	13.50	13.57
Concrete 1:2:4 for copings, per cu.yd.	42.00	25.00	21.40	22.21
Concrete for parapet walls, per cu.yd.	4.50	3.50	3.10	3.88
For 8-in. conc. curb, 2 ft. high, per lin.ft.	1.50	1.00	1.75	1.20
Reinforced-Concrete Roadway Pavement:				
8 in. for approaches, per sq.yd.	3.25	3.00	2.90	2.89
7 in. for ramps, per sq.yd.	3.10	2.90	2.75	2.67
Concrete sidewalk on fill, per sq.ft.	.31	.25	.25	.26
Single lamp conc. lamppost and fixture including 18x18-in. conc. pedestal	90.00	150.00	75.00	126.22
Bronze service box complete	30.00	40.00	40.00	31.07
Earth fill for approaches, per cu.yd.	1.25	.40	1.25	.76
3-ft. reinf.-conc. storm sewer at east approach, per lin.ft.	23.00	15.00	12.00	17.21
4-ft. reinf.-conc. storm sewer at east approach, per lin.ft.	40.00	20.00	20.00	26.39
Manhole for 3-ft. storm sewer	180.00	100.00	50.00	143.00
Manhole at junction of 3- and 4-ft. storm sewers	250.00	100.00	150.00	170.00
Deformed bar reinforcing steel, per 100 lb.	4.00	6.00	5.00	5.00
Working days	350	300	430	

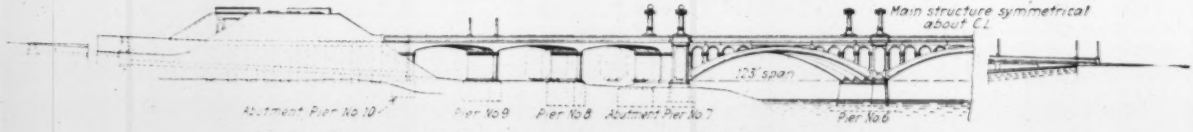


Fig. 1—Buttonwood St. bridge across the Schuylkill River at Reading, Pa.

Current Construction Unit Prices

of class A and will serve as a base for a 2½-in. wearing surface.

Roadway pavement on the bridge for a length of 770 ft. and a width of 42 ft. is asphalt wearing course 2½ in. thick placed directly on the reinforced-concrete floor slab. Bids were asked on three types: asphaltic concrete binder course 1 in. deep, and sheet asphalt wearing surface 1½ in. deep; two courses asphaltic concrete of total depth 2½ in.; rock asphalt wearing surface 2½ in. deep. The roadway pavement of both approaches, except the ramps, is 8-in. reinforced concrete from curb to curb with transverse expansion joints spaced 40 ft. Ramp paving is 7 in. Reinforcing is wire netting 6x6-in. mesh No. 3W and M gage, 67.6 lb. per 100 sq.ft.

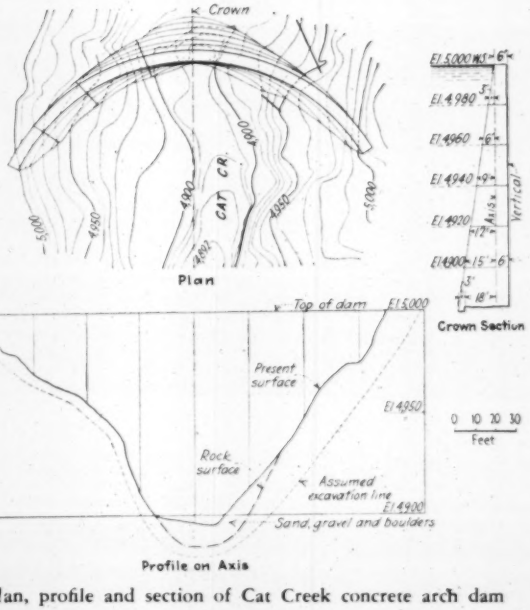
Bidding—The first item is a lump-sum bid including approaches, ramps, storm sewers, maintenance of traffic, and all other work except the asphalt wearing surface on the bridge proper, which is covered by alternate items 2, 3 and 4. The unit prices following, items 5 to 23 inclusive, serve as a basis for adjusting the lump-sum bid in case of increases or decreases. Bids, received from fourteen contractors, range from $416,000, the contract price, to $598,000, bid by Nos. 13 and 14. Unit prices are given of the three lowest bidders and the average of the fourteen bidders. The three are: A, John H. Wickersham, Lancaster, Pa., $416,000; B, York Engineering Co., York, Pa., $424,750; and C, Seeds & Derham, 25 Maplewood Ave., Philadelphia, $432,900. Work is under the supervision of the commissioners of Berks County, Leroy S. Cristman, county engineer. Designing and consulting engineer is the Concrete Steel Engineering Co., Park Row Building, New York.

$100,000 Dam at Hawthorne, Nev.

A CONCRETE arch dam 120 ft. high and 195 ft. long at the crest in Cat Creek Canyon, Nev., was placed under contract in April, 1930, by the U. S. Bureau of Yards and Docks. The dam is at the naval ammunition depot in Hawthorne. The construction is shown in the drawing. Bids were based on assumptions that *(a)* the surface elevations are as indicated, *(b)* rock will be encountered as indicated, *(c)* there will be no artificial obstructions.

Sand and gravel is obtainable 5 miles from site. All concrete is class D, 3,000 lb., mixed 94 lb. cement to 230 lb. sand to 350 lb. gravel to 6 gal. water, or in volume 1 : 2.6 : 3.6 with 5.65 sacks of cement per cubic yard of concrete. Radial construction joints divide the dam into sections. The face of each vertical joint is painted with one thin coat of water-gas tar paint. Expansion sealing strips of soft copper are placed across the joints.

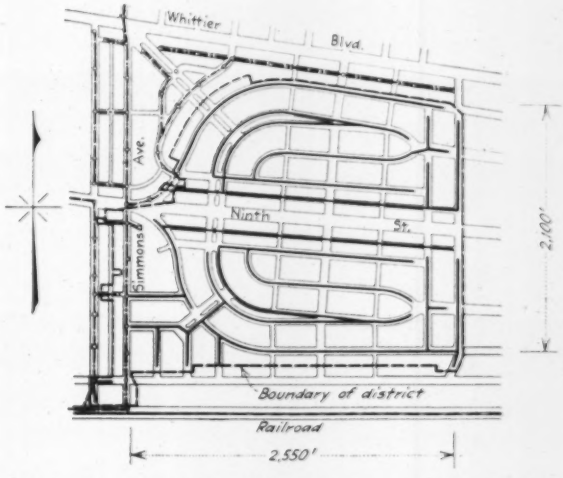
Sixteen bids were received, ranging from $100,000 to $297,000 and averaging $149,000, and the contract was let to the low bidder, T. G. Rowland, 1558 Yale Ave., Salt Lake City. The dam was designed by the U. S. Bureau of Reclamation.



Plan, profile and section of Cat Creek concrete arch dam

Sewers for Los Angeles County

THE accompanying diagram shows the layout and extent of vitrified clay pipe sewers to be built for the Los Angeles County Improvement District 928, which is residential and rather sparsely developed. The soil will require practically no reinforcement. Cost of the work is increased by the requirement that contractors must first finish and then be paid in bonds. Says W. F. Foster, engineer of sanitation for the county, "That requirement increases the cost of the work to be done over work done under acts by



Sewer plan, Los Angeles County Improvement District 928

which the contractors are pair monthly or semi-monthly estimates."

Bids received from nineteen contractors averaged $63,000; the low bid on which contract was awarded was $56,966, or 9 per cent less than the others. High bid was $78,747. The accompanying tabulations gives pipe unit prices of the lowest three bidders: A, Gogo & Rados (contract); B, Drainage Construction Co., $57,758; C, M. J. Simonovich and M. Pruch, $58,463.

Vitrified clay pipe	A	B	C
26,000 ft. 8-in.	$0.875	$0.89	$0.92
2,700 ft. 8-in.	1.30	1.40	1.11
870 ft. 10-in.	1.65	1.65	1.20
450 ft. 12-in.	1.50	1.15	1.21
230 ft. 12-in.	2.00	1.85	1.41
22,600 ft. 6-in.	.75	.75	.85
Total bids	$56,966	$57,758	$58,462

Wheelbarrow Scale

(*Continued from p. 829*)

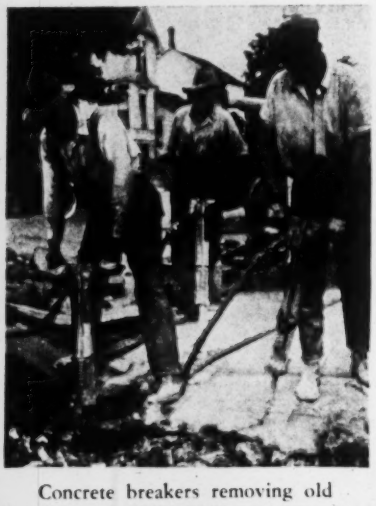
weighing position independently. The beam box can be locked after the poises are set so that they cannot be tampered with. The frame of the scale is open on all sides and the platform may be easily lifted off when necessary to facilitate thorough cleaning of the scale parts. Construction is such that it is proof against danger of disarrangement while in transport from place to place.

New Drifter Drills and Concrete Breakers

Three new drifter drills for tunneling and mining work and two improved concrete breakers are under production by the Sullivan Machinery Co., 400 North Michigan Ave., Chicago, Ill. The rock drills, which are uniform in design, are produced in three sizes for drilling holes to a maximum depth of 15, 20 and 30 ft. respectively. Cylinder sizes are 3, 3½ and 4 in. and weights 122, 159 and 190 lb. The two smaller sizes can be equipped with spring handles in place of mounting shells for use as heavy-duty sinking drills.

Tunneling drill on pillar mounting

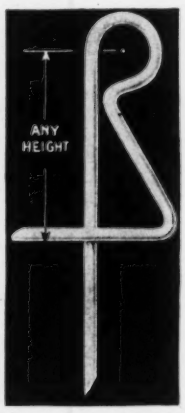
The concrete breakers comprise a 72-lb. unit, K-5, intended for ordinary work, and an 80-lb. machine for use under unusually heavy conditions, such as breaking up reinforced concrete. For the latter model, the K-6, striking block or anvil construction is available. A feature of both breakers is the novel design of front head and steel retainer. This retainer is of the cam type, without springs or trunnion, and permits the steel to be locked and released easily by hand or foot pressure.



Concrete breakers removing old pavement

Wire Device Supports Dowels

Included in the line of 21 accessories for road and bridge construction developed by the Union Steel Products Co., Albion, Mich., is a new dowel bar support made of heavy hard steel wire which is easy to place and which holds bars rigidly and accurately in position. The supports which can be handled as easily as nails, are thrust directly in the subgrade until the crossbar is flush with the surface, resulting in a uniform and accurate height for the dowel bar. Two sizes are available, for 1-in. or ¾-in. dowels.



Dowel support

Leather for Floors

Leather and other fibers thoroughly mixed and impregnated with a special asphalt emulsion and so manufactured that the ends of the fibers are exposed to wear form the basis of a new type of heavy-duty industrial flooring that has been introduced under the name of Leatherok. Extraordinarily long wear under severe service conditions is the outstanding advantage claimed for this new material, which forms a resilient surface that is fireproof, dustless, self-healing and easy to lay, and provides sufficient insulation against transmission of heat or sound. As the material can be laid directly on wood, concrete, steel or any other solid underfloor by means of a special asphalt cementing compound, considerable saving in space results over the customary industrial floor consisting of a cinder fill and a plank underfloor in addition to the surfacing material.

Leatherok was first developed by the Endicott-Johnson Corp., one of the country's largest shoe manufacturers, which evolved the idea of using scrap leather as a flooring material in its own plant. Results were so successful that the product was taken over by Leatherok Floors, Inc., 136 Federal St., Boston, Mass., which has patented the material and designed special machinery for producing it in large quantities.

New Publications

Earth-Moving Equipment—Uses of the Ateco hydraulic dirt mover are featured in a 12-page bulletin 131, issued by the American Tractor Equipment Co., Oakland, Calif., and Peoria, Ill.

Electric Hoists—A folder describing a new line of electric hoists with capacities from 1,000 to 6,000 lb. has been issued by the Wright Manufacturing Co., Bridgeport, Conn.

Graders—Bulletins describing the contractors' special elevating grader with 42-in. carrier and the model 37 road grader have been issued by the Austin-Western Road Machinery Co., 400 North Michigan Ave., Chicago, Ill.

Industrial Cars and Equipment—Catalog 9 of the Biehl Iron Works, Inc., Reading, Pa., contains 80 pages of descriptive matter relating to a large variety of industrial cars and accessories.

Portable Air Compressors—A recent 8-page bulletin of the Sullivan Machinery Co., 400 North Michigan Ave., Chicago, Ill., describes portable air compressors of the railroad type.

Grader Blades—Outstanding qualities of Shunk grader blades are detailed in a pamphlet which may be obtained from the Shunk Mfg. Co., Bucyrus, Ohio.

Pulling Jack—Uses of the Handy-Andy junior pulling jack are outlined in a 4-page leaflet issued by the John Waldron Corp., New Brunswick, N. J.

Leaning Wheel Grader—A catalog describing the Caterpillar 30 leaning wheel grader has been issued by the Caterpillar Tractor Co., Peoria, Ill.

Power Scraper—Atlas Conveyor Co., Inc., Philadelphia, Pa., has issued a 6-page illustrated pamphlet on the use of the cable power scraper for the storage of coal and other bulk material.

Concrete and Masonry Treatment—American Fluresid Co., 27 East Water St., Cincinnati, Ohio, has issued three pamphlets dealing with the uses of Fluresid, a hardener and waterproofer for concrete; Duromit, a special type of hard aggregate for concrete floors, and Lapidensin, a waterproof preservative for brick, stone and stucco.

Core Drills—A new catalog illustrating and describing in detail a complete line of core drills, supplies and equipment has just been issued by Sprague & Henwood, Inc., Scranton, Pa.

Highway-Rail Crossings—Bulletin 512 of the A. O. Smith Corp., Milwaukee, Wis., describes the Smithsteel highway-rail crossing, which is composed of three types of steel sections furnished in standard lengths. This unit was described in *Engineering News-Record*, April 2, 1931, p. 582.

Steel—Bars, plates, structural shapes and rail steel products of the Inland Steel Co., First National Bank Building, Chicago, Ill., are listed in a 48-page pocket-size catalog, "Sizes We Roll and Standard Extras."

Spiral Conveyors—Catalog 495 of the Jeffrey Mfg. Co., Columbus, Ohio, describes six principal types of spiral conveyors and accessories, including the following: sectional flight, helicoid, mixer, cut flight, ribbon and cast iron.

Reinforcing Mesh—Economies of floor and roof construction using Steeltex, a wire reinforcing mesh with integral fiber backing that combines reinforcement and form, are outlined in a 24-page illustrated catalog issued by the National Steel Fabric Co., Union Trust Building, Pittsburgh, Pa.

Concrete—A new edition of the "Handbook of Concrete Construction" has been issued by the Universal Atlas Cement Co., 208 South La Salle St., Chicago, Ill. This pocket-size volume contains 208 pages and many illustrations. It is written from a practical rather than a technical standpoint to provide, in convenient form, useful information on both plain and reinforced concrete. The list price is $1 per copy.

Concrete Road Accessories—Data book No. 2 of the Truscon Steel Co., Youngstown, Ohio, entitled "Modern Road Construction," devotes 128 pages to modern concrete paving practice, with specific reference to products of the company used in this type of work. These include welded steel fabric, dowel plates, road forms, expanded metal, curb bars, guard posts, highway crossings and installation accessories. The book is priced at $1 per copy and contains many illustrations.

CONSTRUCTION NEWS

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Some of the Week's Large Projects

For further details turn to the appropriate sections in this issue

Waterworks			
Quebec City (Que.)	Reservoir	$1,000,000	Proposed
Sewers			
New Britain (Conn.)	Sewers and disposal system	1,745,000	Proposed
Chicago	Sewer, pumping station, etc.	7,500,000	Proposed
Bridges			
Chicago	Bridge	1,491,257	Contract
New Hampshire	Bridge	1,200,000	Proposed
Grade Crossings			
Elizabeth (N. J.)	Grade crossings	10,000,000	Proposed
Power and Lighting			
Utah	Gas mains	1,000,000	Day labor
Federal Government			
Washington	Coast Guard	3,000,000	Proposed
Washington	Heating plant	5,749,000	Proposed
Texas	Dredging	5,500,000	Proposed
Factories and Mills			
Buffalo	Plant addition	2,000,000	Separate Contracts
Tecumseh (Ont.)	Canning plant	1,000,000	Proposed
Power Plants			
Pryor (Okla.)	Hydro-electric plant	2,000,000	Proposed
Buildings			
San Antonio	Athletic club	1,000,000	Proposed
Buffalo	Hospital	1,000,000	Proposed
New York	Hospital	1,500,000	Proposed
New York	Office	2,000,000	Proposed
New York	Office	15,000,000	Proposed
St. Paul	City hall and court house	3,000,000	Bids asked
Reading (Pa.)	Court house	1,548,968	Contract
Quincy (Ill.)	High school	1,350,000	Proposed
San Francisco	War memorial, opera house, etc.	5,000,000	Bids asked

WATERWORKS

PROPOSED WORK

Mass., Great Barrington—Town plans survey to annex Long Pond water with Great Barrington System. Est. $40,000. A. P. Culver, Fire Dist. Comr. and W. T. Day, moderator.

Mass., Provincetown—Town, F. H. Barnett, chn. Selectmen, waterworks, incl. mains, standpipe with pumping facilities. $125,000. Noted Mar. 5.

N. J., Parsippany—Parsippany-Troy Hills Twp. Com. waterworks, P. Boughton, engr. $325,000. Noted Feb. 5.

N. J., Swedesboro—Mayor and City Council, gravel filter well. $20,000.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., rejected bids Apr. 14, mains in Croes, Fairfield, and Fteley Aves. Noted Apr. 23.

O., Canton—Soon takes bids replacing old centrifugal lift pumps and screens in 8 wells. $25,000. W. E. Sarver, Canton, engr.

Ont., Brockville—Pub. Utilities Comn., soon takes bids installing automatic chlorination unit. A. L. Farquharson, Victoria Hall, engr.

Que., Quebec City—Soon takes bids 780 ft. covered reservoir, 310 ft. wide, 20 ft. deep, on Plains of Abraham. $1,000,000.

Que., St. Stanislas—Deux Rivieres Municipality soon takes bids 22,800 ft. 4- to 8-in. c.i. pipe, constructing cistern, concrete dam. $40,000. R. Morissette, Cap de la Madeleine, engr.

BIDS ASKED

Calif., San Francisco—May 20 (extented date), by S. J. Hester, secy. Bd. P. Wks., City Hall, constructing San Joaquin Valley Pipe Line in San Joaquin Division of Hetch Hetchy Aqueduct, under Hetch Hetchy Contract 123, incl. 47.5 mi. 59- to 70-in. steel riveted or lockbar and welded, rein-con., alternate for Sect. C only for City and San Francisco Co. $5,000,000. M. M. O'Shaughnessy, city clk. Noted Apr. 23.

Calif., Sanger—May 19, by F. Niles, city clk., deep well turbine pump, 700 g.p.m. at total head 200 ft., of which 52 ft. will be estimated well head-direct connected to vertical aut-start electric motor.

Kan., Kansas City—May 20, by Bd. P. Utilities, C. A. Louder, secy., piping at new water and light plant, incl. steel and water pipe valves, fittings, regulators, specialties, meters, installation and painting, welding pipe, tanks, installing equipment purchased in previous contract. Burns & McDonnell Eng. Co., 406 Interstate Bldg., Kansas City, Mo., engrs.

N. Y., Brooklyn—May 19, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Avenues T and U, Amersfort, Flatlands, Fountain, and Hegeman Aves., Burnett, 68th, East 2nd, East 4th, East 5th, East 29th, and East 35th Sts.

N. Y., Canajoharie—June 3, by Village Municipal Bd., 8 mi. pipe, appurtenances, C. C. Hopkins, 349 Cutler Bldg., Rochester, engr.; adv. E.N.-R. May 14. Noted Mar. 19.

N. Y., Long Island City—May 19, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in Ditmars Blvd., Union Turnpike, Utopia Parkway, Kent and Radnor Rds., New Haven, Flatlands, Hegeman, 31st, 32nd, 43rd, 68th and 77th Aves., 23rd, 27th, 44th, Ingram, Loubet, 78th, 84th, 159th, 171st, 172nd, 193rd, 200th, 215th, 252nd, 62nd, Haring, 77th, 235th Sts., Queens Boro.

N. Y., New York—May 19, by J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Bway., Columbus, Madison, St. Nicholas, 4th, 9th, 11th and 12th Ave., Bond, Crosby, Lewis, Marginal, Pitt, Sheriff, Sullivan, Thompson, West Houston Sts.

N. Y., Yorktown Heights—May 22, by Yorktown Heights Water Dist., S. S. McBridge, chn., Legion Hall, 6 mi. 4- to 10-in. c.i. pipe lines, valves, hydrants. Barker & Wheeler, 11 Park Pl., New York, engrs.; adv. E. N.-R. May 14.

Pa., Lancaster—June 3 (extended date), at office T. W. Metzger, mayor, City Hall, c.i. force mains, reinforcing mains, 5 m.g. stand pipe, and founds. J. N. Chester Engineers, 813 Clark Bldg., Pittsburgh, engrs.; adv. E. N.-R. May 14.

Pa., Phila—May 21, by Dpt. P. Wks., Bureau Water, City Hall Annex, A. Murdock, dir., Contr. 1025—steel pipe fittings Belmont Pumping Station $4,500; Contr. 1026—two 30 in. flanged cone deck valves.

Tenn., Lebanon—May 26, by City, City Hall, waterworks, incl. 1½ m.g.p.d. filtration plant, raw water pumping station, laying 6 mi. c.i. pipe. Wiedeman & Singleton, Chandler Bldg., Atlanta, Ga., engrs. Noted Nov. 20.

Que., Joliette—May 15, by E. H. Lippe, city engr., filter equipment, low lift pumps, 3,000,000 Imperial gal. mechanical gravity filtration plant.

CONTRACTS AWARDED

Calif., San Francisco—S. J. Hester, secy. Bd. P. Wks., City Hall, fabrication and welded steel pipe for Sect. 1, University Mound Pipe Line, to Consolidated Steel Corp., 273 7th St., $77,070. Noted Apr. 9.

Mo., St. Louis—Bd. P. Serv., 208 City Hall, 5 in. rein.-con. covering for 2 water storage reservoirs on Compton Hill, Grand Blvd., to J. J. Gilmore, 844 Rush St., Chicago, Ill., $222,400. Est. $315,000. Noted Apr. 2.

N. Y., Jamaica—Jamaica Water Supply Co., 161-20 89th Ave., steel tank, water tower, 92nd Ave. and 127th St., to Chicago Bridge & Iron Wks., 30 Church St., New York. Est. $65,000. Noted May 7.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, mains in 35th Ave., to S. Gallucci, 33 Railroad Ave., Corona, $4,769. Noted Apr. 16.

N. Y., Long Island City—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., New York, iron removal filters and steel tanks and pipe line Jamaica and Springfield Pumping Stations, to Charles Meads Co., 217 West 14th St., New York, $133,300. Noted Apr. 9.

N. Y., Mannsville—Village, water supply, to Stowell Constr. Co., 201 Seitz Bldg., Syracuse, $22,827. Est. $30,000. Noted Dec. 25.

N. Y., New York—Bd. Water Supply, 346 Bway., materials for Drainage Shaft 9-A, City Tunnel, Contr. 232, to Cramp Brass & Fdry. Co., Richmond and Norris Sts., Phila., Pa., $236,461. Noted Apr. 16.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., mains in Croes Ave., to Sareno Contg. Co., 1957 Colden Ave., $12,200. Noted Apr. 23.

N. Y., New York—J. J. Dietz, comr. Water Supply, Gas & Electricity, Municipal Bldg., 6 in. valves in various streets, to Bronx Water Wks. Corp., 1 Riverdale Ave., $10,240. Noted Apr. 26.

O., Conneaut—Installing clear well at municipal waterworks plant, to Johnson & Ericksen, Ashtabula, $25,549 est. $25,000; constructing intake pipe, submerged intake crib at water plant, to Thacher Bros. Contg. Co., 1206 Cherry St., Toledo, $38,864 est. $40,000.

Pa., York—York Water Co., brick, concrete, head house, filtration plant, hollow metal doors, filter equipment, slag roof, c.i. pipe, copper, rock excav., to Consolidated Eng. Co., 20 East Franklin St., Baltimore, Md., $500,000. Noted Nov. 6.

Utah, Salt Lake City—City Comrs., 15,000 ft. 30 in. welded steel pressure line and 21,200 ft. 36 in. welded steel flow line, to Morrison-Knudson Co., Boise, Idaho, $257,714. Est. $254,695. Noted Apr. 30.

SEWERS

PROPOSED WORK

Calif., Long Beach—City Council, North Long Beach Sewerage System, incl. heavy vitr. clay pipe. $650,000. H. Paterson, city engr.

Conn., New Britain — Morris Knowles, Inc., engrs., Westinghouse Bldg., Pittsburgh, Pa., submitted report storm, sanitary and disposal system additions, incl. new storm sewers $460,000, activated sludge type sewer beds, 12 m.g.d.c. $1,000,000, reinforcement sanitary lines, Fairview Cemetery and Christian Lane, trunk line additions, Hartford Ave., Oneida, Barnesdale, Stanley and Market Sts., also 48 and 66 in. lines Main St. to Piper Brook. $285,000. Total $1,745,000.

Ill., Chicago—Sanitary Dist. of Chicago, 910 South Michigan Ave., 1 mi. 17 ft. diam. horse-

See proposal advertising on page 95

Constr. News page 205

LEADITE

Trade Mark Registered U.S. Pat. Office

Regarding that "OR EQUAL" phrase

Many specifications and bidding-forms refer to (something definite),—"OR EQUAL," etc.

Now, in many cases, THAT "CLAUSE" is unquestionably fitting and altogether proper,—particularly where there are several products (or devices) of similar quality and merit, which might be considered for the desired use.

However, where long experimentation and actual service experience have "definitely proven" that one product possesses characteristics and advantages not common to so-called "EQUAL" or similar products, it seems to be questionable whether these products should be classified or specified as "equals" (even though they are manufactured to be used for the same purpose).

Of course,—someone might suggest, that in these progressive days, there is NO ONE PRODUCT vastly superior in quality, characteristics and advantages, to its competitive products. However, the best answers to this are: (1) What results has the product given over a period of years in service? (2) Who uses the product, and "why" do they use it? (3) How long has the product been used? (4) What do the users think of the product?

Another point,—is the "PRICE" OF THE PRODUCT. After all, one can safely say that "ONE ONLY GETS WHAT ONE PAYS FOR,"—and as a nationally known motor car maker used to advertise,—it's a question of "WHAT COMES AFTER THE PURCHASE PRICE?"

In conclusion,—we feel that the "OR EQUAL CLAUSE" in specification and bidding-forms, should mean EXACTLY WHAT IT IMPLIES, i.e.: EQUAL IN EVERY WORTH WHILE RESPECT TO THE PRODUCT WITH WHICH IT IS COMPARED. One can purchase almost anything represented to be "just as good," at a lower price,—but, IS IT JUST AS GOOD IN EVERY WORTH WHILE RESPECT? THAT, seems to be the problem for progressive and careful purchasers to seriously consider.

The Pioneer self-caulking material for c. i. pipe.
Tested and used for over 30 years.
Saves at least 75%.

THE LEADITE COMPANY
Land Title Building Philadelphia, Pa.

No Caulking

Sewers (Continued)

shoe shaped concrete sewer for West Side Sewage Treatment Plant, $2,500,000; pumping station, blower house and aeration tanks for Calumet Sewage Treatment Works, $5,000,000-$6,000,000. E. J. Kelly, 910 South Michigan Ave., engr.

Ill., Sparta—City Council plans sewerage system, $60,000.

N. J., Newark—Bd. City Comrs., City Hall, preliminary plans storm sewer in Morris Canal from Lockwood St. to Lister Ave. thence to Passaic River. $150,000. J. Costello, city engr.

N. J., Westfield—City Council, storm sewer in South Ave. $65,000 voted. F. S. Tipson, mayor.

Tenn., Memphis—See "Streets and Roads."

Tenn., Memphis—Referendum bond election July 7, $400,000; sewerage and drainage; $850,000, general street improvement.

Ont., Sudbury—New sewage disposal plant, involving grading, electric service, poles, watermain, approaches, $65,000. W. McMullen, Mackie Bldg., engr. F. A. Dallyn, 71 King St. W., Toronto, consult. engr.

Ont., Toronto—East York Twp. 8 in. and up, vitr. tile, sanitary and storm sewers, earth excavation in Bayview, Lumeley, Moore, Hillside and Noel Aves. $43,816. G. K. Jack, 443 Sammon Ave., engr.

BIDS ASKED

N. J., Plainfield—June 1, by Common Council, 5,800 lin.ft. 45- to 84-in. rein.-con. storm sewer, 110 ft. 84 in. sewer laid in tunnel, and 1,900 ft. 8- to 12-in. sanitary sewers. A. W. Vars, city engr.

N. Y., Brooklyn—May 20, by H. Hesterberg, pres. Brooklyn Boro. Boro Hall, storm water sewers in Shore Rd. Blvd., Lakeland Pl., Neptune, Coney Island, Ocean View, Neptune, and Emmons Ave.; sewers in East 51st, East 53rd, East 42nd, East 5th, East 3rd and 68th Sts.

N. Y., New York—May 15, by S. Levy, pres. Manhattan Boro, Municipal Bldg., New York, sewers in 10th Ave., 35th, 36th, 37th, 38th, 39th and 34th Sts.

N. Y., St. George—May 20, by J. A. Lynch, pres. Richmond Boro, Boro Hall, sanitary sewers in Norden St. and Myrtle Ave.; bituminous concrete paving Greenleaf Ave.

Pa., Chester—May 19, by City Council, G. J. Hunter, supt. Dpt. Streets & Pub. Impvts., sewage improvement and sewage disposal work. Contr. 13 Revised and Contr. 13-A; adv. E.N.-R. May 14.

Pa., Erie—May 19, by H. L. Munger, director Streets, City Hall, sewage lift station, 10 in. c.i. mains, appurtenances, at Lakeside subdivision. J. N. Chester Engineers, 813 Clark Bldg., Pittsburgh, engrs.

CONTRACTS AWARDED

Ill., Chicago—Sanitary Dist. of Chicago, 910 South Michigan Ave., North Side Intercepting Sewer, Contr. 10-A, Div. A, control chamber and drop connection at Berteau Ave., to D'andrea & Valente, South Chicago, $8,877; Div. B, control chamber and drop connection at Devon Ave., to W. T. Graves, 2722 Logan Blvd., $5,583.

Ill., Chicago—Sanitary Dist. of Chicago, 910 South Michigan Ave., J. J. Sullivan, clk., Salt Creek Intercepting Sewer, Contr. 3-A, incl. 360 lin.ft. 3 ft. 6 in. sewer in LaGrange Park Village, to E. J. Albrecht & Co., 38 South Dearborn St., $12,310.

Me., Brunswick—Town, Bd. Selectmen, 3,470 lin.ft. 12- to 20-in. sewer, 36 catch basins, 9 manholes, to Litchfield & Donnelly, Brunswick. Est. $25,000. Noted Apr. 9 Daily.

Mo., St. Louis—Bd. P. Serv., City Hall, Sect. B-3, Western Mill Creek Public Relief Sewer to Frazier-Davis Constr. Co., Arcade Bldg., $108,576. Noted Apr. 2.

N. J., Bradley Beach—City Comrs., sewage outfall pipe from Ocean Park Ave. to sea, to T. Proctor Co., Long Branch, $18,020. Noted Apr. 3.

Tex., Amarillo—City, V. N. Durham, mgr., furnishing, laying 1,300 lin.ft. 4 and 2,700 ft. 6 in. clay tile sewers, to Dempster Co., Amarillo, at $0.76 and $0.90 per ft. respectively.

Que., Montreal—Trunk sewer in St. James St. and Western Ave., to Eastern Constructors Ltd., $199,320; section of northern trunk sewer in Kelly St., to Henault & Hefferman, $195,300.

Que., St. John's—City, canalizing, altering surface waters of Jackwood Creek in connection with sewerage system, to Eastern Constr. Co. Ltd., Montreal, $177,607.

WASTE DISPOSAL

PROPOSED WORK

R. I., Providence—City, Dpt. P. Wks., plans incinerator plant. $500,000. S. F. Nolan, City Hall, archt.

BRIDGES

PROPOSED WORK

Idaho, Boise—State Hy. Dpt., soon takes bids Fairview Bridge over Boise River.

New Hampshire—State, Concord, new toll bridge over Great Bay between Durham and Fox Pt., Newington Co. $1,200,000 appropriated by State Legislature.

Tex., Victoria—Victoria Co. and State soon takes bids rein.-con. and steel bridge over Guadalupe River. $65,000. D. K. Shepherd, Victoria, resident engr.

Ont., Kitchener—L. S. Lichty, Court House, engr., soon takes bids Phillipsburg Bridge, 160 ft. span, $30,000, and Sherers Bridge, 80 ft. span, $12,000, both steel spans on concrete abutments, concrete flooring, earth grading, for Waterloo Co.

BIDS ASKED

Calif., San Francisco — May 20, by S. J. Hester, secy. Bd. P. Wks., City Hall, Sloat Blvd. Viaduct at Sunset Blvd., incl. 28,350 cu.yd. excav., 4,150 cu.yd. Class B 2,500 lb. concrete, 43 cu.yd. Class A 300 lb. concrete (rails), 840,000 lb. bar reinforcing steel, vitr. pipe, storm drains, catch basins. $160,000. M. M. O'Shaughnessy, city engr.

Kansas—May 22, by State Hy. Comm., Court House, Leavenworth, four 30 ft. span deck girder and two 80 ft. span steel truss bridge, incl. 80,950 lb. reinforcing steel and 178,100 lb. structural steel, K92, F.A.P. 268 F, Leavenworth Co. W. V. Buck, Topeka, hy. engr.

La., New Orleans—May 19, by City Council, 105 ft. steel I-beam bridge, creosoted pile found., 20 ft. roadway, 4.5 ft. sidewalk, over London Avenue Canal at Mirabou St.

Maine—May 20, by State Hy. Dpt., Augusta, steel superstructure Sheepscot Bridge, Palermo, incl. 135,600 lb. metal; substructure and floor for same bridge, 358 cu.yd. concrete—Cold Stream Bridge, West Gardner, 252 cu.yd. concrete—Frost Bridge, Wales, 109 cu.yd. concrete—Rich Hill Brook Bridge, Standish, 112 cu.yd. concrete—Palmyra Bridge, Palmyra, 133 cu.yd. concrete—Tacoma Lake Bridge, Monmouth, 320 cu.yd. concrete—Babcock Bridge, Litchfield and West Gardner, 700 cu.yd. concrete—Branch Mills Bridge, China, 147 cu.yd. concrete.

Minn., Duluth—May 21, by W. H. Borgen, aud. St. Louis Co., Court House, Bridge C-3-6-1 on Zimmerman Rd. Sect. 6, Twp. 51 North Range 13 W.; Bridge d-4-35-2 on Lismore Rd. Sect. 35, Twp. 52 North, Range 14 W. S. Shepard, Court House, co. engr.

N. J., Newton—May 19, by Bd. Comrs. Sussex Co., Court House, concrete bridge over Moore's Brook, at Moran St.—bridges on Morris Lake Rd., Sparta Twp.—over Lake Lackawanna Inlet, Lubber's Run, Bryan Twp. $25,000. H. Snook, Court House, co. engr.

N. Y., Brooklyn — May 19, by A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, Metropolitan Avenue Bridge over English Kills.

N. Y., New York—May 22, by A. Goldman, comr. Plant & Structures, Municipal Bldg., bracing columns of Washington Bridge over Harlem River.

N. Y., Syracuse—May 25, by A. W. Brandt, Comr. Hys., Albany, reconstructing bridge on Cicero-Brewerton Rd. Hy. 5249, and Syracuse-Watertown Rd., Hy. 278, R.C. 2171, Onondaga and Oswego Counties; adv. E.N.-R. May 14.

Ohio—May 19, by O. W. Merrell, dir. hys., Columbus, steel beam and concrete beam bridges, Sect. "Manchester" Ohio River Rd., Adams Co., with brick approaches $51,274, concrete approaches $50,727 — steel truss bridge, approaches, Sect. "G" Cleveland-Meadville Rd., Ashtabula Co., $21,151—concrete beam and concrete slab bridges, Sect. "H" Columbus-Washington C. H. Rd., Franklin Co., $32,418—concrete beam bridge, Sect. "B" Columbus-Chillicothe Rd., Franklin Co., $7,919—concrete beam bridge, Sect. "B" Wickliffe-Madison Rd., Lake Co., $36,952—three 67 ft. and two 54 ft. span steel beam bridge, Sect. "Clarington Bridge" Ohio River Rd., Monroe Co., $82,457—4 concrete slab bridges, two with 22 ft. span, one with 24 ft. span and one with two 35 ft. spans, Sect. "C-2" and "D" Oak Hill-Portsmouth Rd., Scioto Co., with brick approaches $30,018, concrete $29,474—three 140 ft. span steel truss bridge, Sect. "A" Mt. Vernon-Coshocton Rd., Coshocton Co., with brick paved approaches $149,586, with concrete $148,833.

Okla., Tulsa—May 19, by City Comrs. E. Logan, clk., eighteen 86 ft. spans concrete bridge over Arkansas River at 21st St., incl. 3,500 lin.ft. railing between rail posts, 1,350,000 lb. New Bilet reinforcing steel, 7,450 sq.yd. asphaltic paving, $500,000. Cochrane, Woos & Witten Wright Bldg., engrs. Noted May 7.

Ont., Hamilton—June 2, by A. Kent, city clk., 400 ft. steel, concrete high level bridge, 70 ft. James, Proctor & Redfern, 1004 Excelsior Life Bldg., Toronto, engrs. Noted Apr. 9.

CONTRACTS AWARDED

Arkansas—State Hy. Dpt. Little Rock, 521 ft. rein.-con. deck girder bridge, concrete piers, abutments, Job 953, Searcy Co., to M. H. Franks, Marshall, $37,524 est. $46,840—three 80 ft., two 10 ft. and one 35 ft. span steel truss and concrete girder bridge, concrete piers, abutments, Job 10179, Greene and Clay Counties, to Fife Constr. Co., Inc., Dickinson, Tenn., $77,625 est. $97,000—two 60 ft., one 100 ft. and four 45 ft. span steel truss and deck girder bridge, concrete piers, Job 9158, Van Buren Co., and 437 ft. steel truss and deck girder bridge, concrete piers, abutments, Conway Co., to M. K. Orr, 1523 Bway., Little Rock, $46,155 and $38,751 respectively est. $60,000 and $47,360 respectively—460 ft. deck girder bridge, precast concrete piling, Job 10183, Lawrence and Randolph Counties, to E. O. Korsmo Constr. Co., Memphis, Tenn., $27,401. Grand total $227,456. Noted Apr. 23.

California—See "Streets and Roads."

Georgia—J. W. Barnett, engr., East Point, bridge on Thompson Hy., Federal Aid Project 296 C, Wilkes and McDuffie Counties, to G. A. Clayton, Bona Allen Bldg., Atlanta, $34,238 est. $34,238; 5 bridges on Waycross-Jesup Rd. Wayne and Pierce Counties, to Austin Bros. Bridge Co., 1195 Mickleberry St., Atlanta, $49,826. Noted Apr. 22 Daily, under "Streets and Roads."

Illinois—State Dpt. P. Wks. & Buildings, Div. Hys., Springfield, to Illinois Steel Bridge Co., Jacksonville, bridges on Route 120, Sect. 101-B $15,886; Route 120, Sect. 101-C $6,533; Route 120, Sect. 103-B $28,122; Route 120, Sect. 103-C $6,490, all Logan Co.—to Madison Constr. Co., Edwardsville, Route 103, Sect. 102, Schuyler Co., $26,575—to Vincennes Bridge Co., Vincennes, Ind., Route 103, Sect. 102-C Schuyler Co., $11,917—to Watt Constr. Co., Winchester, Route 120, Sect. 115-B, Piatt Co. $35,037—to Continental Bridge Co., 460 Monadnock Bldg., Chicago, Route 120, Sect. 115-C, Piatt Co. $7,210. Grand total $137,770.

Ill., Chicago—L. Nettlehorst, secy. Bd. Comrs. Lincoln Park, Clark and Center Sts., and A. M. Connelly, secy. Bd. South Park Comrs., 5700 Cottage Grove Ave., and H. E. Young, consult. engr. of each board, at office Chicago Plan Co., 208 West Washington St., substructure and superstructure double leaf trunnion bascule bridge over main branch Chicago River at Outer Dr., connecting South Park and Lincoln Park Boulevard systems, to Ketler Elliott Co., 3161 South California Ave., $1,491,237. Price does not include masonry, operatives houses, and enclosure walls. Noted Apr. 2.

Iowa—State Hy. Comm., Ames, bridges, culverts in Clay Co., to Graves Bros. Constr. Co., Melvin, $8,500—Fayette Co., to Brennan Bros., Lansing, $6,965—Louisa Co., to Snyder & Johnson, Humboldt, $55,227, to A. Olson Constr. Co., Waterloo, $63,367 and to W. L. Nusser, Iowa City, $21,700—Osceola Co., to Graves Bros. Constr. Co., Melvin, $26,490—Winnebago Co., to Waugh & Tackman, Clarksville, $8,700, to Forgie & Groth, Sioux Center, $7,999, and to C. Jensen, Thompson, $20,125—Jackson Co., to P. Jayne, Cedar Rapids, $22,868. Grand total, $241,941.

Ia., Charles City—Floyd Co., two 36 x 20 ft. span I-beam bridge, two 40 x 20 ft. span and two 36 x 20 ft. span I-beam bridges, 2 grading projects, incl. 37,000 cu.yd. excav., channel change, relocating, to J. B. Elliott, Independence, $27,782; to W. R. Garland, New Hampton, $4,977; and to I. O. Florence, Thompson, $7,632. Grand total $40,391.

Ia., Clinton—Clinton Co., 16 wooden bridges, 11 culverts, to E. Endorf, Wheatland, $8,000—4 I-beam bridges, re-erecting pony truss bridge, raising I-beam bridge, to P. Jayne, Cedar Rapids, $9,256—high truss bridge, to J. H. Hunzinger & Co., Davenport, $1,767. Grand total $19,023.

Kentucky—See "Streets and Roads."

Louisiana—See "Streets and Roads."

Maine—State Hy. Dpt., Augusta, steel superstructure bridge over Androscoggin River between Brunswick and Topsham, incl. 2,317,000 lb. steel, to Boston Bridge Wks., Binney St., Cambridge, Mass., $121,509; substructure, approaches, floor, incl. 4,243 cu.yd. concrete, to Southern New England Contr. Supply Co., New London, Conn., $103,407. Noted Apr. 30.

New York—A. W. Brandt, comr. Hys., Albany, bridges in Herkimer Co., to Harrison & Burrows, Inc., Englewood, N. J., $52,861 est. $74,817—in Franklin Co., to Lord & Humphrey, Malone, $56,434 est. $73,510—in Herkimer Co., to O'Grady & Quinlan, Cohoes, $59,183 est. $88,824—in Delaware Co., to Spooner Bridge Constr. Co., 488 Bway., Albany, $27,465 est. $33,159—in Monroe Co., to C. Shaffer & Sons, 42 Skillman St., Buffalo, $58,976 est. $84,847. Grand total $254,919. Noted Apr. 2 and 9.

Okla., Guthrie—State Hy. Dpt., Oklahoma City, 6 span 899 ft. steel truss bridge on concrete piers, Logan Co., to L. Sanders, Tradesmens Bldg., Oklahoma City, $102,024. Est. $110,000. Noted Apr. 23.

Pa., Pittsburgh—R. B. Woodside, controller Allegheny Co., McKees Rocks-North Side Bridge, 1.18 mi. long, 40 ft. wide, 210 ft. high, over Ohio River, incl. 51,700 sq.ft. concrete and 66,700 sq.ft. rein.-con. sidewalks, 28,800 lb. reinforcing steel, paving, removing O'Donovan Bridge, to Harrison Constr. Co., 21st and Sidney Sts. $272,277, 9,200 lin.ft. safety guard rail, to Pressed Steel Car Co., Farmers Bank Bldg., $35,395; superstructure Boston Bridge over Youghiogheny River, incl. 4,000,000 lb. carbon steel, 60,000 lb. cast steel, 36,500 sq.yd. bridge floor, grading, to Fort Pitt Bridge Wks., Oliver Bldg., $228,248, electrical conduits, to W. C. Hemmerle Electric Co., 212 Olympia St. $4,389, guard rail, to Pittsburgh Annealing Box Co., Neville Island, $10,545. Grand total $550,854. Noted Apr. 16.

Texas—G. Gilchrist, state hy. engr., Austin, 16 span steel, concrete bridge, Brown and McCulloch Counties, to Austin Bridge Co., Box 1094, Dallas, $116,700 est. $130,000—28 span concrete girder bridge, Fannin Co., to Municipal Eng. Co., Athletic Bldg., Dallas, $41,876 est. $50,000—rein.-con., steel bridge, Harris Co., to Don Hall, Inc., 522 Cotton Exch. Bldg., Houston, $41,964—steel superstructure for same bridge, to American Bascule Bridge Co., Pensacola, Fla., $24,498—rein.-con. bridges, Ellis and Johnson Counties, to Hannah Constr. Co. and F. and D. Hall, Box 994, Waco, $29,021 est. $44,000—rein.-con. bridges, Fayette Co., to R. B. Holifield, 4847 Gurley St., Dallas, $27,837 est. $36,000—5 steel, concrete bridges, Bowie and Morris Counties, to E. Pettus, Montgomery, $91,076 est. $100,000—7 rein.-con. bridges, McLennan Co., to W. S. Crawford, Dallas, $45,593 est. $50,000. Grand total $418,565.

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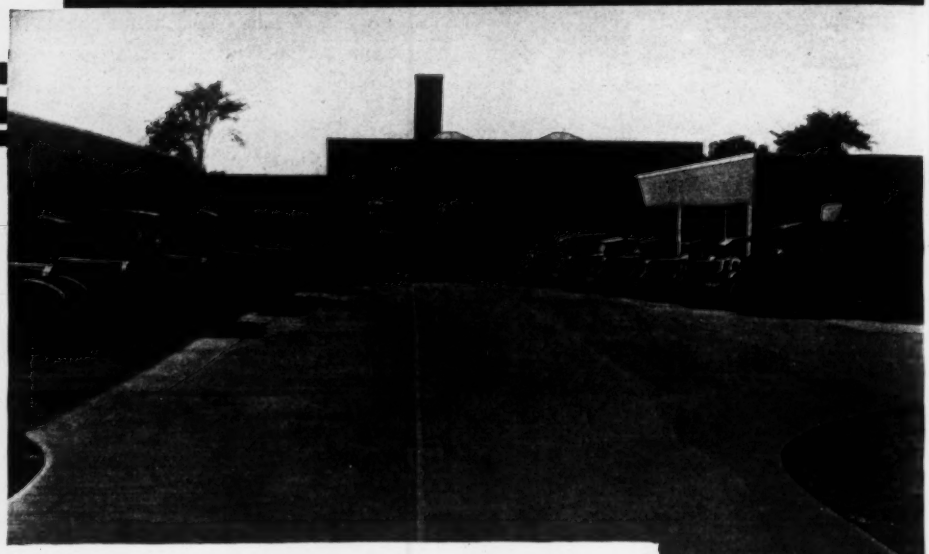

Pavement in new central yard of Hackensack Water Co., Hackensack, N. J. W. W. Gutteridge, engineer for the company; Jos. Kinzley Co., contractor, both of Hackensack.

High-Early-Strength Pavement Ready for Heavy Traffic in 3 Days

"The buildings in the new construction and store yard of the Hackensack Water Co. were completed only three days before the time set for operating this yard. It was therefore necessary to arrange for a pavement that would bear the traffic of heavy trucks within three days," writes W. W. Gutteridge, company engineer. "Concrete had already been chosen for paving and Universal Atlas high-early-strength concrete was used to meet the time limit."

At 3 days the concrete tested over 2000 lbs. per sq. in. in compressive strength and was ready for use. From 11 to 25 days of valuable working time was thus saved the water company.

High-early-strength concrete made with Universal Atlas methods and cement is used for concrete work which calls for speed, greater strength, watertightness and durability. A booklet containing methods for obtaining it will be sent on request.

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STREETS AND ROADS

BIDS ASKED

California—May 20, by C. H. Purcell, engr. State Hy. Comn., Sacramento, clearing, grubbing right-of-way, grading, drainage structures, concrete surfacing 7.2 mi. road between Brighton and Mills, Sacramento Co.—grading, drainage structures, bituminous treated rock borders on 8.7 mi. road between Dunnigan and point 1 mi. south of Arbuckle, Yolo and Colusa Counties—asphaltic road oil surfacing 15.5 mi. road between Buckhorn Creek and second crossing Cuyama River, Santa Barbara Co.—grading, drainage structures, bituminous treated crushed gravel or stone surfacing 3.5 mi. road between French Camp and Stockton, San Joaquin Co.—4 bridges from 30 to 105 ft. long, also widening 2 rein.-con. bridges, between Goshen and Kingsburg, Tulare Co.

Calif., San Francisco—May 20, by S. J. Hester, secy. Bd. P. Wks., City Hall, grading, embankment, concrete steps, concrete walks, asphaltic concrete paving 30,000 sq.ft. Ingerson Ave. between Ingalls and Hawes Sts.

Idaho—May 19, by A. Harbour, comr. P. Wks., Boise, grading, oiling, graveling 12,500 cu.yd. Roosevelt Hy., between Beeche's Corner and Ririe, Bonneville Co.

Ind., South Bend—May 25, by Bd. Comrs. St. Joseph Co., Improving Ice Rd. $110,000: Turkey Creek Rd., $75,000. F. P. Crowe, aud.

Ia., Cresco—May 23, at office Auditor Howard Co., gravel and re-gravel surfacing 42 mi. trunk and local roads.

Kansas—May 20, by State Hy. Comn., Court House, Eureka, grading, culverts 8.046 mi. Kansas Project 96, Federal Aid Project 396-D, Greenwood Co. W. V. Buck, Topeka, hy. engr.

Louisiana — June 2, by State Hy. Comn., Baton Rouge, grading, gravel surfacing 7.6 mi. Marion-Huttig Hy., Union Parish — asphaltic treatment 13 mi. Turkey Creek-Route 22 intersection Hy.—15.53 mi. Boutee-Raceland Hy., St. Charles and Lafourche Parishes—20 mi. St. Joseph-Tallulah Hy., Tensas Parish—1.8 mi. Lysle-Fenton Hy., Allen and Jefferson Parishes—10 mi. Simmesport-Mansura Hy., Avoyelles Parish—11 mi. Franklinton-Mississippi State Line Hy., Washington Parish—grading, drainage structures 4 mi. Basile-Elton Hy., Natchitoches and Red River Parishes—10.265 mi. Glenmore-Alexandria Hy., Rapides Parish—9.75 mi. Donner-Schriever Hy., Tellebone Parish—14.4 mi. Morganza-Lettsworth Hy., Point Coupee Parish—14 mi. Oberlin-Elton Hy., Allen and Jefferson Parishes—concrete surfacing 10.1 mi. Elton-Kinder Hy., Jefferson Davis and Allen Parishes — 6.8 mi. Lettsworth-Rapides Hy., Pointe Coupee Parish—11 mi. Monroe-Archibald Hy., Ouachita and Richland Parishes—13 mi. Gueydan-Kaplan Hy., Vermillion Parish—10.917 mi. Hawthorne-Hornbeck Hy., Vernon Parish—8 mi. hy. north and south of St. Joseph, Tensas Parish—11.149 mi. St. Martinsville-Breaux Hy., St. Martin Parish. H. B. Henderlite, hy. engr.; adv. E. N.-R. May 14.

Maryland—May 19, by State Roads Comn., Baltimore, G. C. Uhl, chn., sheet asphalt paving 0.45 mi. Contr. BC-103-72, Baltimore City—gravel surfacing 1.87 mi. Contr. Ch-105-84, Charles Co.—macadam paving 1.76 mi. Contr. H-121-42, Harford Co.—concrete surfacing and channel excavation of Anacostia River, 2.16 mi. Contr. P-164-311, Prince Georges Co.; adv. E. N.-R. May 14.

Massachusetts—May 19, by Dpt. P. Wks., Boston, bituminous macadam paving 2.215 ft. hy. Mansfield—8,772 ft. Topsfield—4,500 ft. Hanson—bituminous macadam widening 8,914 ft. Salisbury—rein.-con. and bituminous macadam (dual type) paving 3,000 ft. Milton. A. W. Dean, Dpt. P. Wks., Boston, engr.

Michigan—May 20, by H. W. Hagaman, div. engr., 504 Eddy Bldg., Saginaw, grading, shaping, drainage structures, concrete paving 1.306 mi. M056-21C-2, Midland Co., 20 ft., for State Hy. Comn., Lansing.

Mississippi—May 18, by State Hy. Comn., Jackson, concrete surfacing 4 mi. Collins-Mt. Olive Hy., Covington Co.; 4 mi. Brookhaven-Thayer Hy., Lincoln Co. E. D. Yewell, hy. engr.

ASK FOR LIST OF BIDDERS AND THEIR BIDS ON 47 MISSOURI STATE HIGHWAY JOBS OPENED MAY 2.

CONSTRUCTION DAILY

TENTH AVE. AT 36th STREET

Neb., Omaha—May 26, by G. Berger, clk. Douglas Co., Court House, grading, curbing, concrete paving 11,800 sq.yd. Route 44 (Happy Hollow Rd.) L. Adams, Court House, co. engr.

New Hampshire—May 21, by State Hy. Dpt., Concord, grading, rein.-con. paving 37,895 sq.yd. Daniel Webster Hy., Franklin and Tilton. $170,947.

N. Y., Brooklyn—May 20, by H. Hesterberg, pres., Brooklyn Boro, Boro Hall, asphalt by heater method resurfacing Cheever and Prospect Pls., Lincoln, 6th, 4th Aves., Bergen, Crescent, Dean, Pacific, Sackman, Wyona and 14th Sts.; grading, asphalt on 6 in. concrete paving Court Sq., Driggs, Sheridan Aves., Avenues T and O, Boerum, Catherine, East 28th, 52nd, 68th, 90th Sts.

N. Y., Ithaca—May 28, by Dpt. Educ., F. P. Graves, comr., Education Bldg., Albany, pavement, concrete walks, grading at State College of Agriculture, Cornell University; adv. E. N.-R. May 14.

N. Y., New York—May 21, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., sheet asphalt on concrete paving Tibbett Ave. and West 231st St.—asphalt block on concrete repaving East 146th St.—curbing, granite block on concrete repaving East 136th St. and Locust Ave. — grading, curbing, sidewalks on Cruger and Mace Aves.

N. Y., New York—May 21, by S. Levy, pres. Manhattan Boro, Municipal Bldg., grading, sheet asphalt on concrete paving West 46th, West 40th and East 88th Sts.

Ohio—May 15, by O. W. Merrell, dir. hys., Columbus, paving with (a) water-bound macadam (b) concrete 3.92 mi. Sects. "A and B-1" and "B-2" Ashland-Loudonville Rd., Ashland Co. (a) $33,094 (b) $38,777—8.11 mi. Sects. "A" and "D" Bryan-Defiance Rd., Defiance Co. (a) $98,441 (b) $112,509—7.72 mi. Sects. "L" and "M" Ottawa-Defiance Rd., Defiance Co. (a) $90,170 (b) $104,618—2.49 mi. Sect. "A-1" Bellefontaine-Kenton Rd., Hardin Co. (a) $28,395 (b) $31,295—6.1 mi. Sects. "G," "J," "K" and "L" Mt. Vernon-Coshocton Rd., Knox Co. (a) $60,678 (b) $76,207—6.35 mi. Sects. "A" and "B" Newark-Coshocton Rd., Licking Co. (a) $71,210 (b) $81,828—8.982 mi. Sect. "I" and others, Akron-Canfield Rd., Portage Co. (a) $117,696 (b) $116,387—5.13 mi. Sects. "A" and "J" Ashland-Shelby Rd., Richland Co. (a) $12,246 (b) $51,168—2.92 mi. Sect. "O" Mansfield-Shelby Rd., Richland Co. (a) $23,771 (b) $27,992—7.73 mi. Sect. "P" and others, Fostoria-Fremont Rd., Seneca Co. (a) $75,628 (b) $88,896.

Ohio—May 19, by O. W. Merrell, dir. hys., Columbus, grading, drainage structures, paving with (a) brick (b) concrete (c) bituminous macadam (d) gravel resurfacing (e) brick and traffic bound macadam (f) concrete and traffic bound macadam (g) tar macadam (h) water-bound macadam (i) rock asphalt 7.215 mi. Sect. "E" Ohio River Rd., Adams Co. (a) $368,924 (b) $275,881 — 3.575 mi. Sect. "Aberdeen" Ohio River Rd., Brown Co. (a) $225,618 (b) $179,623—0.909 mi. Sect. "F" Lima-Delphos Rd., Allen Co. (c) $20,713—3.485 mi. Sect. "C" Springfield-Mechanicsburg Rd., Champaign Co. (d) $28,140—0.492 mi. Sect. "A" Mt. Vernon-Coshocton Rd., Coshocton Co. (e) $13,634 (f) $9,111—4.8 mi. Sect. "D-1" (New Madison) Greenville-New Paris Rd., Darke Co. (b) $100,150 (c) $116,566—4.676 mi. Sect. "H-1" Columbus-Washington C. H. Rd., Franklin Co. (c) $123,206—1.004 mi. Sect. "P" Roundhead-Mt. Cory Rd., Hancock Co. (b) $21,939 (g) $23,648—1.968 mi. Sect. "O" Roundhead-Mt. Cory Rd., Hardin Co. (b) $43,979 (g) $49,027 — 2.142 mi. Sect. "D-1" and "H" Steubenville-Cambridge Rd., Harrison Co. (a) $134,628 (b) $99,901 (c) $113,778 — 0.331 mi. Sect. "D" Napoleon-Wauseon Rd., Henry Co. (c) $10,863—2.451 mi. Sect. "T-1" Mt. Vernon-Mansfield Rd., Knox Co. (a) $84,785 (b) $63,661 (c) $72,692—1.844 mi. Sect. "B" (Willoughby) Wickliffe-Madison Rd., Lake Co. (f) $119,075—6.149 mi. Sects. "A" and "D" Urbana-Bellefontaine Rd., Logan Co. (b) $138,648 (c) $123,750—1.051 mi. Sect. "A" Toledo-Elmore Rd., Lucas Co. (a) $41,278 (b) $28,228 —1.222 mi. Sect. "A" Toledo-Monroe, Mich Rd., Lucas Co. (a) $66,031 (b) $39,835—1.602 mi. Sect. "C" Malta-Glouster Rd., Morgan Co. (g) $36,814—2.459 mi. Sect. "N-1" Zanesville-Cincinnati Rd., Perry Co. (a) $103,356 (b) $73,895 (c) $89,043—5.184 mi. Sects. "C" and "H" Ottawa-Defiance Rd., Putnam Co. (b) $171,260 (c) $186,567 (g) $171,781 — 3.891 mi. Sects. "C-2," "B" and "So" Oak Hill-Portsmouth Rd., Scioto Co. (a) $209,942 (b) $154,901 —4.829 mi. Sect. "P" Warren-Meadville Rd., Trumbull Co. (b) $165,720 (h) $154,443 —0.537 mi. Sect. "D" Findlay-Upper Sandusky Rd., Wyandot Co. (b) $15,161 (i) $17,880.

O., Cincinnati—May 15, by Comrs. Hamilton Co., concrete paving 11,000 sq.yd. Yononte Rd. from Duck Creek Rd. to Corp. line of city, $56,926—51,400 sq.yd. Blue Ash Rd. from Plainfield Rd. to Cooper Rd., $207,299. E. A. Gast, Court House, engr.

Okla., Nichols Hills (Oklahoma City P. O.)—T. A. Montague, city clk., returned bids unopened grading, 7 in. concrete paving 10,800 sq.yd. Dist. 13, Kings Court, $47,000—11,950 sq.yd. Dist. 11, Avondale Dr, $50,000—6,690 sq.yd. Dist. 10, The Strand, $25,000. Project postponed on account of financing. Bendam Eng. Co., Perrine Bldg., Oklahoma City, engrs. Noted Apr. 23.

Pennsylvania—May 22, by State Hy. Dpt., Harrisburg, grading, drainage structures, bituminous treated macadam surfacing 20,763 sq.yd. Route 658, Halltown Twp., Silverdale Boro, Bucks Co.—grading, drainage structures, one course rein.-con. surfacing 60,093 sq.yd. Route 131, Sect. 1, East and West Nottinghant Twps., Oxford Boro, Chester Co.—38,162 sq.yd. Route 695, Sect. 1-A-7962, Greenville Boro, West Salem Twp., incl. rein.-con. arch bridge and 43 ft. rein.-con. bridges—73,260 sq.yd. Route 80, Sect. 1-A-7961, Wilmington and East Lakawannock Twps., incl. 33 ft. rein.-con. bridges, both Mercer Co.—4,362 sq.yd. Route 197, Cheltenham Twp., incl. rein.-con. arch bridge, Montgomery Co.—19,570 sq.yd. Route A-7537-A, Derry Twp., Westmoreland Co.—3,959 sq.yd. Route 195, Watts and Buffalo Twps., Perry Co. —grading, drainage structures, bituminous surface treated macadam surfacing or bituminous surface treated macadam on broken stone surfacing 7,339 sq.yd. Route A-5901, Lafayette Twp., McKean Co.—67,686 sq.yd. Route 640, Sect. 2, South Beaver Twp., incl. 69 ft. concrete bridges, Beaver Co.—51,181 sq.yd. Route 750, Sect. 1, Cranberry and President Twps., incl. 57 ft. rein.-con. bridges, Venango Co. S. S. Lewis, secy.

Pennsylvania—May 29, by State Hy. Dpt., Harrisburg, macadam and rein.-con. paving roads in Bucks, Clarion, Lancaster, Lycoming, McKean, Cameron, Schuylkill, Snyder, Union, Tioga, Wayne and Westmoreland Counties. S. S. Lewis, secy.; adv. E. N.-R. May 14.

Tennessee—May 22, by State Dpt. Hys. & P. Wks., City Hall, grading, drainage structures 8,958 mi. State Hy. 29 between Dayton and Federal Aid Project 231-F, Federal Aid Project 231-G, incl. bridge over 20 ft. span, Rhea Co. R. H. Baker, hy. comr.

Wash., Chehalis—May 22, by Comrs. Lewis Co., Court House, grading, 8 in. crushed stone paving 2.436 mi. Hanaford Valley Rd. $25,000. R. L. Greene, Chehalis, co. engr.

Wash., Ritzville—May 21, by Comrs. Adams Co., grading, graveling 9,600 cu.yd. Permanent Hy. 15. F. M. B. Reese, Ritzville, co. engr.

Wisconsin—May 20, by State Hy. Comn. and Hy. Com. Kenosha Co., Milwaukee, grading, concrete paving 82,915 sq.yd. Bristol-Union Grove Rd., S.T.H. 75, S.A.P. 2089, Kenosha Co.

Wisconsin—May 22, by State Hy. Comn. and Coms. Iowa, Grant and Lafayette Counties, Herald Bldg., Lancaster, grading 5.49 mi. Highland-Muscoda Rd., S.T.H. 80, S.A.P. 9348. A and B, Iowa and Grant Counties—crushed stone surfacing 5,486 cu.yd. same road—12,364 cu.yd. Warren-Gratiot Rd., S.T.H. 81, S.A.P. 9363, Lafayette Co.—8,9886 cu.yd. Dubuque-Platteville Rd. Hy. 35, F.A.P. 451-B, Grant Co.—2,600 cu.yd. South Wayne-Gratiot Rd., S.T.H. 20, A.F.E. 4,—2,600 cu.yd. Argyle-Blanchardville Rd., S.T.H. 81, A.F.E. 6, both Lafayette Co.—crushed limestone surfacing 9,550 cu.yd. Mineral Point-Belmont and Twp. Rds., U. S. Hy. 118, and Township Rds., Lafayette Co.—mine tailing surfacing 11,682 cu.yd. Hazzards Corners-Darlington Rd., S.T.H. 14, S.A.P. 9386, and Stavers-Corners-Belmont Rd., S.T.H. 126, Gang Maintenance Job 1, Lafayette Co.

Ontario—See "Contracts Awarded."

Ont., Brampton—See "Contracts Awarded."

Ont., Brockville—See "Contracts Awarded."

Ont., Copper Cliff—May 15 by C. H. Fullerton, deputy minister, Dpt. Northern Development, Parliament Bldgs., Toronto, reshaping and rolling 20 ft. wide subgrade, laying penetration top on black base paving 1.3 mi. hy. here and 1.3 mi. between here and Sudbury. $30,000. J. Sinton, Parliament Bldgs., Toronto, engr.

Ont., Kingston—See "Contracts Awarded."

Ont., London—See "Contracts Awarded."

Ont., North Bay—May 15, by C. H. Fullerton, deputy minister Dpt. Northern Development, Parliament Bldgs., Toronto, clearing, grading 14.2 mi. hy. on Ferguson Hy. $30,000. J. Sinton, Parliament Bldgs., Toronto, engr.

Ont., Windsor—Essex Co., expending $200,000 this year, grading, drainage structures, culverts, road maintenance, repairs. Road maintenance by day labor, new road construction by contract. J. J. Newman, Davis Blk., co. engr.

Ont., Woodstock—Oxford Co., J. N. Meathrell, engr., Court House, expending $73,200 new roads, $48,085 for maintenance; $14,490 for bridges, $10,030 for road machinery. Maintenance work to be done by day labor.

CONTRACTS AWARDED

Arkansas—State Hy. Dpt., Little Rock, grading, drainage structures 7 mi. Job 4150 Benton Co. to W. P. McGeorge & Co., Pine Bluff, $65,384; grading, drainage structures, concrete surfacing Job 5134 Jackson Co., to D. H. Dalton Co., Arkadelphia, $177,963.

Arkansas—State Hy. Dpt., Little Rock, grading, drainage structures 5.5 mi. Job 11049 and 5 mi. Job 11050, Monroe Co., to Bunnell & Mack, Paragould, $29,964 and $37,945 respectively est. $50,000 each—9 mi. Job 490, Benton Co., to T. L. Thogmartin & Son, Batesville, $43,227 est. $60,000—5.75 mi. Job 950 Searcy Co., to W. P. McGeorge & Co., Pine Bluff, $76,897 est. $100,000—8 mi. Job 6112, Faulkner Co., to Hill & Evans, Little Rock, $61,830 est. $80,000—3 mi. Job 1128, Grand and Dallas Counties, to W. E. Callahan Constr. Co. Arcade Bldg., St. Louis, Mo., $47,927 est. $70,000—grading, drainage structures, concrete surfacing 6 mi. Job 694, Hot Springs Co., to J. P. McNulty, Pine Bluff, $87,178 est. $100,000—concrete surfacing 4.5 mi. Job 6123, Prairie Co., to Hays Constr. Co., Jackson, Tenn., $70,801 est. $80,000—gravel surfacing 14.5 mi. Job 7160, Union Co., to Delamar & Allison, Arkadelphia, $18,193 est. $30,000. Grand total $473,962. Noted Apr. 23.

California — State Hy. Comn., Sacramento, bituminous treated crushed gravel or stone surfacing 7.3 mi. road in Tehama Co., and 5.3 mi. also widening 4.7 mi. Humboldt Co., to Hemstreet & Bell, Marysville, $59,487 and $62,685 respectively—grading 1.4 mi. Plumas Co., to Chigras & Sutsos, 2211 18th St., San Francisco, $69,135—furnishing, applying heavy fuel oil as dust layer 38.9 mi. Tuolumne and Mariposa Counties, to Basalt Rock Co., Napa, $11,990—grading, asphaltic paving 12.1 mi. Tulare Co., to Union Paving Co., Call Bldg., San Francisco, $305,561. Grand total $508,858. Noted Apr. 9.

Georgia—J. W. Barnett, engr., East Point, to Nichols Contg. Co., 1281 La France St., Atlanta, grading 13.9 mi. Jones Co., $91,093; grading, 3 bridge culverts, topsoiling 16.9 mi. Laurens Co., $106,859; 6.34 mi. Madison Co., $27,359—to Davis Constr. Co., Rhodes-Haverty Bldg., Atlanta, 1 bridge, concrete paving 9.614 mi. Carroll Co., $181,995—to Dickson-Carroll Co., Montgomery, Ala., concrete paving 3.885 mi. Habersham and Stephens Counties, $124,651—to Ballenger Paving Co., Greenville, S. C., 5 mi. Elbert Co., $118,714—to J. B. McCrary Co., Citizens & Southern Bank Bldg., Atlanta, 6.3 mi. Douglas Co., $115,917—to Espy Paving & Constr. Co., Savannah, Ga., 2 bridge culverts, concrete paving 0.214 mi. Bullock Co., $178,019—to H. E. Wolfe Constr. Co., Macon, 2 bridges, concrete paving 9.3 mi. Schley Co., $234,462; 3 bridges, concrete paving 7.368 mi. Montgomery and Wheeler Counties, $194,025—to Murray Constr. Co., 508 Union Ave., Knoxville, Tenn., paving 12.4 mi. Coffee Co., $151,740—to Milsap & Parker,

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Streets and Roads (Continued)

Southern Ry. Bldg., Birmingham, Ala., asphalt paving 3.5 mi. Wayne and Pierce Counties, $99,653—to S. E. Finley, 292 North Ave., Atlanta. 11.4 mi. Seminole and Early Counties, $126,162. Grand total $1,750,049.

Illinois—State Dpt. P. Wks., & Buildings, Div. Hys., Springfield, to Lefferdink Constr. Co., Lincoln, grading roads in Logan and Mason Counties $10,576, DeWitt Co. $55,616. Route 120, Sect. 102A, $18,223; Route 120, Sect. 103A, $22,049—both Logan Co., to I. Putnam, Van West, O., Carroll and Whiteside Counties, $43,512—to P. Malone, Harrisonville, Mo., Rock Island and Whiteside Counties $126,095—to Birt Bros., Decatur, grading, paving roads in Henderson and Hancock Counties $125,224—to Central Eng. Co., 809 Putnam Bldg., Davenport, Ia., Route 88, Sect. 126-RS $39,178; Route 9, Sect. 46W-RS $65,185, both Peoria Co.; Madison Co. $129,361; La Salle Co. $47,136—to McCarthy Impvt. Co., Kahl Bldg., Davenport, Ia., Lake Co. $156,165, DeKalb Co. $180,631; Route 4, Sect. 66-RS $194,001, Route 4, Sect. 65-RS $245,342, both Madison Co.—to Airey Constr. Co., Oak Park, DeWitt and Piatt Counties, $103,856—to S. Jaicks, Oak Park, Kane Co. $56,049—to S. J. Groves & Sons Co., 306 Globe Bldg., Minneapolis, Minn., Will and DuPage Counties $201,124—Kane and Kendall Counties $201,812, to States Impvt. Co., 160 North La Salle St., Chicago, Cook Co. $176,558—to J. Mackler & Co., Chicago Heights, DuPage Co. $176,021—to Cameron-Joyce & Co., 170 South Smith St., Keokuk, Ia., Logan Co. $65,985; grading roads in Piatt Co. $28,202. Grand total $2,467,990. Noted Mar. 19.

Ill., Edwardsville—Madison Co., to McCarthy Impvt. Co., Kahl Bldg., Davenport, Ia., widening, 2½ in. brick on concrete paving 10.05 mi. Route 4, Sect. 65-RS, $245,342, 8.28 mi. Route 4, Sect. 66-RS, $194,001, 5.83 mi. Route 11, Sect. 47-RS, $129,361. Grand total $568,704.

Iowa—State Hy. Comn., Ames, grading, drainage structures, paving 0.173 mi. roads in Butler Co., to Waugh & Tackerman, Clarksville, $4,943—0.231 mi. Polk Co., to Wright Constr. Co., 1325 Main St., Des Moines, $8,059 — grading, drainage structures 1.316 mi. Clinton Co., to J. B. Hannahs, Keokuk, $12,565—0.303 mi. Muscatine Co., to Snyder & Johnson, Humboldt, $2,639—roads in Louisa Co., to R. J. Ryan, Missouri Valley, $64,180—7.06 mi. Osceola Co., to J. W. Ault, Des Moines, $32,691—5.89 mi. P-750-B, Winnebago Co., to J. J. Boyette, Kensette, $33,273—7.873 mi. P-752, Winnebago Co., to J. Fox, Forest City, $44,246. Grand total $202,596.

Ia., Ft. Dodge—Webster Co., gravel surfacing secondary road system, to H. Miller, Hartley, $48,116.

Kansas — State Hy. Comn., Court House, Olathe, **(F.A.P. means Federal Aid Project)**, to Geiger & Rutherford, Leavenworth, grading, drainage structures 7.412 mi. F.A.P. 277-B $57,697; 5.935 mi. F.A.P. 215-B, $34,656, both Linn Co.—to Reed & Wheelock, Clay Center, 3.805 mi. Ellsworth Co., $106,493—to J. J. Cullen & Sons, Kinsley, 1.317 mi. Hamilton Co., $8,582—to Perry Constr. Co., Mildred, 1.164 mi. F.A.P. 307-C $5,285; 7.406 mi. F.A.P. 307-D $67,765, both Leavenworth Co.—to E. Graff, Newton, re-gravel surfacing 6 mi. Henry Co. $834—to Harrison Eng. & Constr. Co., Mutual Bldg., Kansas City, Mo., grading, drainage structures, concrete surfacing 6.098 mi. F.A.P. 315-G $134,193; 7.526 mi. F.A.P. 404-B $153,338, both Johnson Co.—to E. D. Tyner Constr. Co., Kansas City, Mo., 2.611 mi. F.A.P. 315-D, Johnson Co., $71,319—to G. H. Hansen, Logan, light type surfacing 1.496 mi. Rush Co., $1,316; 0.812 mi. Seward Co., $476; 5.786 mi. Haskill Co., $3,393—to Western Bridge & Constr. Co., Leavenworth St., Omaha, Neb., 11.56 mi. Morris Co., $3,440—to Collins Constr. Co., Leavenworth, 7.972 mi. F.A.P. 268-F $29,536; 5.411 mi. F.A.P. 268-G, $20,049; 1.077 mi. F.A.P. 268-I, $3,952, all Leavenworth Co.—to Thogmartin & Reis, Ft. Scott, 3 mi. Kansas Project 1005, $2,459; 6.904 mi. F.A.P. 362-D, $5,647, both Ottawa Co.; bituminous blotter treating 4 mi. Harvey Co., $2,209; re-gravel surfacing 9 mi. Kansas Project 7299, $3,112; 3 mi. Kansas Project 7297, $1,037; 2 mi. Kansas Project 298, $796, all Sumner Co.—to San Ore Constr. Co., McPherson, light type surfacing 3 mi. Kansas Project 1005, $1,762; 6.904 mi. F.A.P. 362-D, $4,045, both Ottawa Co.; 8.637 mi. Stevens Co., $3,973; 0.812 mi. Seward Co. $374; bituminous blotter surfacing 5.786 mi. F.A.P. 423-C $2,663, Haskell Co.—to Jansen Constr. Co., Kimballton, bridges in Johnson Co. $17,575—to L. H. Ludlow, Chanute, bridges on F.A.P. 270-B, $7,060; on F.A.P. 215-B, $12,697, both Linn Co.—to Meade & Hardman, Alton, bridges in Hamilton Co., $11,021—to Silver & Otis, Osage, bridges in Morris Co., $8,095. Grand total $786,849. Noted Apr. 23.

Kansas—State Hy. Comn., Court House, Leavenworth, culverts, gravel surfacing 7.972 mi. Kansas Project 92, Leavenworth Co., to Collins Constr. Co., Leavenworth, $29,536—7.46 mi. Kansas Project 30, Leavenworth Co., to Cherry Constr. Co., Mildred, $67,765—grading, culverts, concrete surfacing 6.098 mi. Kansas Project 10, and 7.626 mi. U. S. Hy. 50, Olathe Co., to Harrison Eng. & Constr. Co., 506 Mutual Bldg., Kansas City, Mo., $134,193 and $153,338 respectively — 2.611 mi. Kansas Project 10, Olathe Co., to E. D. Tyner Constr. Co., 14th and Elmwood Sts., Kansas City, Mo., $71,319. Grand total $456,151. Noted Apr. 9.

Kentucky—State Hy. Dpt., Frankfort, grading, drainage structures, using 1st class D vitr. pipe, 3.356 mi. road in Bell Co., to Patterson Constr. Co., Heidrick, $33,077—grading, drainage structures, using 1st class rein.-con. pipe, 11.5 mi. Christian Co. and 7.407 mi. Grayson Co., to J. M. Perkins Co., Frankfort, $84,457 and $29,563 respectively—4.12 mi. Kenton Co., to G. M. Francisco, 3947 Stettinlus St., Cincinnati, O., $78,403—6.892 mi. Madison Co., to O. V. Arnett, Brea, $46,079—rock asphalt surfacing 4.564 mi. Christian Co., to E. L. Traughber, Elkton, $68,404—traffic bound limestone surfacing 8.666 mi. Grayson Co., to Ralph Rogers Co., Bloomington, Ind., $46,320—14.819 mi. Muhlenberg and Todd Counties, to McLellan & Moss, Bowling Green, $53,991—15.111 mi. Ohio Co., to Ellis & Kelly, Owensboro, $87,667—overhead crossing, also grading, traffic bound limestone surfacing approaches, Warren Co., to E. Hardy & Son, Pulaski, $28,634—bridge over Beech Fork, also grading approaches, Warren Co., to J. A. Cometto, Huntington, W. Va., $23,115. Grand total $579,710. Noted Mar. 18.

Louisiana—State Hy. Comn., Baton Rouge, to James Stanton Constr. Co., Alexandria, concrete surfacing Project 1003, Arcadia Parish, $128,986—to Couch Bros. Constr. Co., Dothan, Ala., Project 1906, Calcasieu Parish, $171,400; Project 3502, Jefferson Davis Parish, $335,390—to Union Paving Co., Triad Bldg., Baton Rouge, Project 5806, Evangeline and St. Landry Parishes, $312,841—to J. B. McCrary Co., 1408 Citizens & Southern Life Bldg., Atlanta, Ga., Project 2505, Desoto and Sabine Parishes, $199,327—to Inglis Constr. Co., Gretna, Project 1503, Beauregard Parish, $366,574 — to Dunn Constr. Co., Lincoln Life Bldg., Birmingham, Ala., Project 4203, Madison Parish, $244,333; Project 7101, West Carroll and Richland Parishes, $368,127—to S. E. Johnson Co., 218 Terminal Bldg., Toledo, O., Project 4301, Morehouse Parish, $234,109—to Southern Paving & Constr. Co., Volunteer Life Insurance Bldg., Chattanooga, Tenn., and Houma, La., Project 4802, Pointe Coupee and West Baton Rouge Parishes, $211,081—to A. N. Goldberg, 902 Louisiana Bldg., New Orleans, Project 4804, Pointe Coupee Parish, $292,692—to Garrett Constr. Co., Springfield, Mo., Project 4909, Rapides Parish, $182,079—to Ayers & Graves, Hope, Ark., Project 4912, Rapides Parish, $211,769—to Lawrence Constr. Co., Jackson, Miss., Project 6108, St. Tammany Parish, $155,779—to G. L. La Boiteaux, 2926 Lewis St., Toledo, O., Project 4604, Lafourche and Terrebonne Parishes, $384,840—to Cobb Bros. Constr. Co., Meridian, Miss., Project 6801, Washington and St. Tammany Parishes, $179,309; Project 7200, West Feliciana Parish, $91,697 — to Nelson Bros., 1106 Columbia Tower Bldg., Memphis, Tenn., Project 4002, Lincoln and Union Parishes, $421,806; surface treating Project 2602, East Baton Rouge and East Feliciana Parishes, $94,080—to R. B. Tyler Co., 1446 Levering St., Louisville, Ky., Project 1004, Acadia and St. Landry Parishes, $140,734; Project 1005, Acadia Parish, $126,487; Project 1602, Jackson and Bienville Parishes, $93,428; concrete paving Project 5807, St. Landry and Arcadia Parishes, $372,729—to N. P. Turner General Constr. Co., Marshall, Tex., surface treating Project 1907, Beauregard and Calcasieu Parishes, $71,454—to Kentucky Road Oiling Co., Louisville, Ky., Project 6802, Washington Parish, $50,143; Project 2603, East Feliciana and West Feliciana Parishes, $140,875; Project 6208, Tangipahoa Parish, $105,735; Project 7201, West Feliciana Parish, $71,336—to Hardware Constr. Co., Columbus, Ga., Project 2901, Evangeline and Rapides Parishes, $135,900—to McGuire & Cavender, Texarkana, Project 2902 Evangeline and St. Landry Parishes, $162,726—to Frazier-Hamilton Co., Pittsburg, Kan., Project 7306, Winn Parish, $90,022—to R. C. Webb, Delta, grading, drainage structures Project 2302, Clairborne Parish, $71,014—to Gifford-Hill & Co., Inc., Forest Hill, Project 4408, Natchitoches Parish, $67,911; Project 4409, Natchitoches Parish, $111,801—to M. Tansey, Oak Grove, Project 4908, Rapides Parish, $33,925 — to Carey Constr. Co., Inc., 214 Pan American Bldg., New Orleans, Project 4911, Rapides Parish, $83,858—to J. W. McKeithen & Grayson, Project 4913, Rapides Parish, $38,648 — Guess, & Albin, Jonesboro, Ala., Project 5204, Sabine Parish, $75,554—to Koss Constr. Co., New Orleans, bridge, Project 6500, Ouachita and Union Parishes, $228,964—to Doullut & Ewing, Inc., 901 Q. & C. Bldg., New Orleans, bridge, Project 6600, Jefferson Davis and Vermilion Parishes, $134,127. Grand total $6,987,680. Noted Apr. 2.

Mo., Clayton—St. Louis Co., Court House, to Bangert Bros. Constr. Co., Ferguson, bituminous macadam paving 9,713 ft. Kerth Rd., $71,585; 5,585 ft. New Halls' Ferry Rd., $15,874; 10,995 ft. Ladue Rd., $39,127—to Skrainka Constr. Co., Security Bldg., St. Louis, rein.-con. paving 2,080 ft. Charbonier Rd., $31,299; to J. F. McMahon Contg. Co., Buder Bldg., St. Louis, 6,970 ft. Airport Rd., $59,785—to E. Fehlig, 14 South Central Ave., bituminous macadam on sledge stone paving 2,778 ft. Spring Dr., $12,685; 845 ft. Mary Ave., $6,436; 1,411 ft. Scenic Dr., $8,935—to M. Behnke, Rural Route, Jefferson Barracks, rein.-con. culvert at Telegraph Rd., $2,089—to O. R. Kammerer, 6105 Delmar Blvd., St. Louis, 465 ft. Madison Ave., $770. Grand total $248,585. Noted Apr. 23.

Neb., Prague—City Comn., grading, concrete paving 13,300 sq.yd. Center Ave., Elba and Railroad Sts., to Central Bridge & Constr. Co., Wahoo, $25,475.

New Jersey—State Hy. Comn., Trenton, 8 in. rein.-con. paving 97,936 sq.yd. Burlington Co., to E. H. Ellis, Westville, $413,515. Noted Apr. 23.

N. J., Paterson—Passaic Co., Court House, grading, concrete paving Valley Rd., to R. S. Sowerbutt, 244 Highland Ave., $137,259. Noted Apr. 9.

New York—A. W. Brandt, comr. Hys., Albany, bituminous macadam paving 0.998 mi. Chemung Co., to G. D'Angelo, Peoples Trust Bldg., Binghamton, $71,168 est. $98,727—0.77 mi. Steuben Co. to W. L. Collins, Hornell, $21,395 est. $29,393. Noted Mar. 26.

New York—A. W. Brandt, comr. Hys., Albany, concrete paving 2.2 mi. Oneida Co., to Koettoritz & Blakeslee, Little Falls, $99,845 est. $120,930—3.43 mi. Allegany Co., to W. L. Collins, Hornell, $149,069 est $191,338—6.47 mi. Seneca Co., to J. Bellardino, Seneca Falls, $260,793 est. $322,498—5.94 mi. Madison Co., to Dale Eng. Co., 330 Pulaski St., Syracuse, $277,921 est. $352,456—5.37 mi. Greene Co. and 2.75 mi. Columbia Co., to New Haven Road Constr. Co., Inc., 1847 Dixwell Ave., New Haven, Conn., $272,200 and $113,865 respectively, est. $391,356 and $153,836 respectively—0.37 mi. Oneida Co., to C. Scialdo & Son, Herkimer, $42,961 est $59,698 — 3.95 mi. Clinton Co., to Clinton Paving Co., Plattsburg, $142,990 est. $191,317—5.47 mi. Columbia Co., to J. Arborio, Inc., West Cedar St., Poughkeepsie, $286,981 est. $432,734 — 1.05 mi. Orange Co., to W. G. Saltsman, Highland Mills, $58,255 est. $88,424 — 4.9 mi. Tioga and Broome Counties, to Parlor City Constr. Co., 21 Exchange St., Binghamton, $219,813 est. $277,823—7.48 mi. Herkimer Co., to Riteway Constr. Corp., 299 Bway., New York, $369,625 est. $465,932—8.39 mi. Jefferson Co., M. K. Eng. Co., Inc., Plaza St., Albany, $303,980 est. $417,809—5.33 mi. Lewis Co., to Law Bros. Contg. Corp., Herkimer, $278,650 est. $358,895 bituminous macadam paving 0.626 mi. Skinnerville-New Home Bridge Rd. and Buffalo-Millersport Rd., to L. H. Gipp Constr. Co., 94 Claremont Ave., Buffalo, $26,362 est. $37,324—8.54 mi. Warren Co., to Zoli & DeMichael, Indian Lake, $312,645 est. $433,749—8.14 mi. Otsego Co., to Kelleher Corp., Turners Falls, Mass., $260,543 est. $366,436—7.02 mi. Essex Co., to Green Island Constr. Co., Inc., Green Island, $284,642 est. $350,125—graveling 7.31 mi. Seneca Co., to D. L. Dennis, Eldred, $241,098 est. $313,697—asphalt paving 1.08 mi. Oneida Co., to Onondaga Constr. Co., 831 Lancaster Ave., Syracuse, $18,850 est. $23,183. Grand total $4,021,097. Noted Mar. 19, Apr. 2 and 9.

N. Y., Long Island City—A. Goldman, comr. Plant & Structures, Municipal Bldg., New York, grading, paving area under Queens Viaduct connection to Queens Boro Bridge, to Meehan Paving Co., 90 West St., New York, $20,175. Noted Apr. 23.

N. Y., New York—H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., to Meehan Paving Co., 90 West St., granite block paving West 261st St. $6,919; East 141st St. $35,627; East 166th St. $10,833—to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., East 165th St. $64,617; asphalt paving Theriot Ave. $16,493—to C. Turiano Contg. Co., 2913 Coddington Ave., regulating East 231st St. $9,955 — to Morris Park Contg. Co., 1991 Cruger Ave., Ellison Ave. $19,425—to A. Caserta, 2442 Barnes Ave., sewer in Fish Ave. $4,731—to F. Pestone, 489 Lenox Rd., Brooklyn, Matthews Ave. $1,871. Grand total $170,471. Noted Apr. 30.

N. Y., New York—S. Levy, pres. Manhattan Boro, Municipal Bldg., paving Forsyth St., to Rosoff Bros., 521 5th Ave., $88,961—granite block paving Gansevoort St., to E. T. Barry, 126-06 139th Ave., Laurelton, $30,376—asphalt paving Chestnut St. and Bway., to C. D. Beckwith, Inc., Seneca Ave. and Edgewater Rd., $2,878 and $16,951 respectively—sidewalks, to J. L. Brennan, 839 Gerard Ave., $7,200. Grand total $146,366. Noted Apr. 16.

N. Y., St. George—J. A. Lynch, pres. Richmond Boro, Boro Hall, granite block paving North Burger Ave., to J. Johnson Sons, 455 Bway., West New Brighton, $20,047; bituminous concrete repaving Bodine St., to J. E. Donovan, 2205 Richmond Terrace, Port Richmond, $23,095. Noted Apr. 30.

Pennsylvania — State Hy. Dpt., Harrisburg, grading, drainage structures, 3 in. on 6 in. macadam surfacing 47,039 sq.yd. road in Allegheny Co., to Ross Constr. Co., Inc., 161 Perrysville Rd., Pittsburgh, $150,282—grading, waterbound macadam surfacing 42,160 sq.yd. Columbia Co., to Central Pennsylvania Quarry Stripping & Constr. Co., Hazelton, $131,809—20,158 ft. Westmoreland Co., 18 ft., to E. H. Canon, West Elizabeth, $120,884. Grand total $402,975. Noted Apr. 16.

Pa., Pittsburgh — Allegheny Co., County Bldg., grading, rein.-con. paving 4,494 ft. Laketon Rd., Penn Twp., 20 ft., to Allegheny Contg. Co., Columbia Bank Bldg., $82,886—6,876 ft. Rochester Rd., Ross Twp. and West View Boro, 20 ft., to F. W. Scott, Hays, $132,246—rein.-con. paving 7.9 ft., and widening 10,200 ft. Washington Pike, Greentree Boro, 30 ft. and two 5 ft. strips, to F. S. Tillman, 328 4th Ave., Tarentum, $74,412. Grand total $289,544.

South Dakota—State Hy. Comn., Pierre, concrete paving 152,275 sq.yd. Clay Co., to Larson Erling Co., Sioux Falls, $335,983 est. $350,000—76,284 sq.yd. Beadle Co., to Jenson Paving Co., Rapid City, $178,463 est. $180,000 — 438,135 sq.yd. Moody Co., to Western Asphalt Paving Corp., 2100 East 4th St., Sioux City, Ia., $258,076 est. $260,000. Grand total $772,522.

Texas—G. Gilchrist, state hy. engr., Austin, to Westark Constr. Co., McAlester, Okla., concrete paving 141,285 sq.yd. hy. Wharton Co., $254,733 est. $300,000; 103,501 sq.yd. Matagorda Co., $186,329 est. $200,000; 72,989 sq.yd. Brazos Co., $121,150 est. $150,000—to Dodds & Wedegartner, San Benito, 91,094 sq.yd. Henderson Co., $168,881 est. $200,000—to Lacy Paving Co., 202 Burt Bldg., Dallas, 51,839 sq.yd. Waller Co., $89,179 est. $110,000—to J. P. Foty, 411 Burt Bldg., Dallas, 49,841 sq.yd.

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Streets and Roads (Continued)

Grayson Co., $77,592 est. $100,000—to Haden & Austin, Post Dispatch Bldg., Houston, double bituminous surface treating 122,496 sq.yd. Grimes Co., $22,004 est. $26,000—to Cocke & Braden, Marshall, 437,607 sq.yd. Kent Co., $32,296 est. $40,000—to Brown & Root, Inc., Colorado St., Austin, 155,232 sq.yd. Blanco Co., $27,45 est. $30,000—to J. W. Zempter Constr. Co., Box 497, Amarillo, widening existing concrete base and 2 in. bituminous concrete paving (modified Topeka type) 89,541 sq.yd. Tarrant Co., $101,864 est. $160,000—to Froemming Bros., Inc., Seymour, rein.-con. paving 134,967 sy.yd. Grayson Co., $210,056 est. $260,000; grading, drainage structures, concrete paving 149,600 sq.yd. Fort Bend Co., $333,336 est. $400,000—to Amer. Paving Co., 1325 Grace St., Omaha, Neb., 230,270 sq.yd. Lavaca Co.,$356,183 est. $440,000—to Trinity Farm Gravel Co., Box 1116, Dallas, gravel and crusher-run broken stone base course surfacing 1,302 sq.yd. De Witt Co., $93,733 est. $120,000—to R. B. Holifield, 4847 Gurley St., Dallas, triple asphalt surface treating on gravel base course and double bituminous surface treating 14,990 sq.yd. Caldwell Co., $52,548 est. $68,000—to S. & H. Constr. Co., 92 Mason St., Milwaukee, Wis., concrete paving with 5 ft. shell shoulders, 40,245 sq.yd. Liberty Co., $119,992 est. $120,000—to Field Bros. & McCelvey, 308 Myrick Bldg., Lubbock, grading, drainage structures 5.798 mi. Potter Co., $22,569 est. $36,000; 16.882 mi. Wheeler Co.,$50,997 est. $70,000—to E. F. Bucy & Sons and C. T. Childs, Rising Star, 16.368 mi. Fisher Co., $52,261 est. $76,000—to J. D. George, Donna, 10.941 mi. Bowie Co., $45,657 est. $56,000—to F. P. Jones, Jacksonville, 10.685 mi. McLennan Co., $57,199 est. $84,000—to Geo. W. Condon Co., Dallas, 8.857 mi. Ellis and Johnson Counties, $36,571 est. $58,000—to Keller & Pelphrey, Dallas, 4.546 mi. Pecos Co., $51,142 est. $60,000—to J. F. Leslie, Bailey, 3.62 mi. Fannin Co., $20,216 est. $36,000—to C. H. McClellan, 1402 Travis St., Wichita Falls, 9.393 mi. Hemphill Co., $53,915 est. $68,000; 14.136 mi. Roberts Co., $88,750 est. $120,000—to Lone Star Constr. Co., 802 Milam Bldg., San Antonio, 4.665 mi. Fayette Co., $34,969 est. $52,000—to J. S. Moore & Sons, Lufkin, 9.267 mi. Cherokee Co., $55,066 est. $70,000. Grand total, $2,816,632.

Utah—State Rd. Comn., Salt Lake City, oil processing 38.52 mi. Sanpete and Sevier Counties, to Morrison & Knudsen Co., 319 Bway., Boise, Idaho, $84,476 est. $89,000—13.931 mi. Kane Co., to A. O. Thorne, Springville, $14,432 est. $18,964 — grading, surfacing, constructing 76 ft. timber bridge on 7.407 mi. Emery Co., to Young & Ogden, Richfield, $48,537 est. $58,196. Grand total $147,445. Noted Apr. 28.

Virginia—State Hy. Comn., Richmond, grading, drainage structures, clearing, grubbing, gravel surfacing 2.756 mi. roads in Spotsylvania and Caroline Counties, to Perkins-Barnes Constr. Co., Inc., Blackstone, $22,884—clearing, grubbing, grading, drainage structures, 8-6-8 in. concrete surfacing 0.797 mi. Warwick Co., to Virginia Eng. Co., Newport News, $17,211 — grading, drainage structures, topsoiling 0.104 mi. bridge approaches, Buckingham Co., to M. C. Turner, South Boston, $8,856—twelve 20 ft. and one 50 ft. span steel beam bridge, Essex Co., to Swain Constr. Co., Inc., Hopewell, $20,507. Grand total $69,458. Noted Apr. 23.

Wis., Stevens Point—Concrete paving 40,000 sq.yd., to A. E. Bounsall, Kenosha, $68,980.

Ontario — Northumberland and Durham Counties, G. Greene, engr., Cobourg, expending $250,000 during year grading, graveling, drainage, culverts county roads. Maintenance to be done by day labor.

Ont., Brampton—Peel Co., maintenance work, grading, ditching, culverts, graveling, etc., day labor; mixed macadam paving, by concrete. Est. 165,000. N. L. Powell, County Bldg., engr.

Ont., Brockville—Leeds and Grenville Counties. E. R. Blackwell, County Bldg., Brockville, engr., grading, drainage, repairs, dragging, gravveling, mixed macadam paving roads. Mostly maintenance by day labor. Est. $200,000.

Ont., Carleton Place—Lenark Co., new road between here and Montagne, to Dibblee Constr. Co., 246 Albert St., Ottawa, $100,000.

Ont., Kingston—Frontenac Co., grading, culverts, graveling, macadam surfacing, road maintenance, day labor. $98,000. R. H. Fair, William St., engr.

Ont., London—Concrete paving Hamilton Rd., day labor, under supervision of A. Near, city engr. $30,000.

Ont., Windsor—See "Bids Asked."

Ont., Woodstock—See "Bids Asked."

EXCAVATION, DRAINAGE, IRRIGATION, LEVEES, RIVER AND HARBOR

PROPOSED WORK

Ia., Sioux City — Bd. Comrs. Woodbury Co. preliminary plans drainage ditches. $100,000. J. M. McLean, Court House, engr.

Mass., Boston — Commonwealth of Massachusetts, Dpt. P. Wks., dredging basins, channels in Old Harbor and Dorchester Bay, Dorchester, $400,000. A. W. Dean, Dpt. P. Wks., engr.

N. Y., East Hampton—East Hampton Twp., East Hampton, dredging in Three Mile Harbor. $55,000. **Maturity in June or later.**

N. Y., East Hampton—Suffolk Co., Griffing Ave., Riverhead, harbor jetties, in Three Mile Harbor. $25,000.

B. C., Vancouver—See "Factories and Mills."

BIDS ASKED

Calif., Yountsville—State Division of Agriculture, Sacramento, taking bids 25,000 cu.yd. excav. in connection State Hospital. Noted Feb. 19, under "Hospitals."

La., New Orleans—June 15, by Levee Board, Delacroix Plantation Levee incl. 200,000 cu.yd. excav., J. Elorer, New Orleans, engr.

N. Y., New York—May 22, by A. Goldman, comr. Plant & Structures, Municipal Bldg., dike across Bronx Kills. Former bids rejected. Noted Apr. 30, under "Bridges."

N. Y., Rochester—May 20, by Joint Harbor Survey Com., H. C. Stevenson, chn., harbor development in 23rd Ward. $475,000. MacElwee & Crandall, Inc., 11 West 42nd St., New York, engrs. W. Blanchard, c/o engineers, is its resident engr.

CONTRACTS AWARDED

Mass., Barnstable — Dpt. P. Wks., Boston, dredging 30,000 cu.yd. Barnstable Harbor, to Bay State Dredging & Contg. Co., 62 Condor St., East Boston, $10,820. Noted May 1 Daily.

New York—Bd. Health, S. W. Wynne, pres. Dpt. Health, 505 Pearl St., New York, dredging new ditches and re-digging old ditches in Brooklyn, Queens, Richmond and Bronx Boros. to J. F. Ross, 61-01 60th Ave., Maspeth, $20,500. Noted Apr. 16.

Tex., Brownsville—Cameron Co. Water Impvt. Dist. 13, c/o P. W. Samuel, secy., 305 5th St., irrigation canals, installing concrete pipe, irrigation and concrete lined canals, to Smith & Whitney, 2017 Cedar Springs St., Dallas and San Benito. Est. $500,000. Noted Apr. 16.

Bond Elections

Coming Bond Elections

Waterworks and Sewerage Ext.—Brawley, Calif., $50,000.

Sewerage and Drainage—Memphis, Tenn., July 7, $400,000.

Natural Gas System—De Leon, Tex., $80,000.

Auditorium—Brownsville, Tex., $500,000.

Hospital—Tyler, Tex., Smith County, $250,000.

High School—National City, Calif., $330,000.

Bonds Voted

Pipe Line, Reservoir Impvts.—Calistoga, Calif., $18,000.

Storm Sewer—Westfield, N. J., $65,000. F. S. Tipson, Mayor.

Natural Gas System—Miami, Okla., $150,000. W. L. Rush, Mayor.

Bonds Defeated

Airport—Cedar Rapids, Iowa., $40,000.

FEDERAL GOVERNMENT

PROPOSED WORK

Ark., Brinkley—POST OFFICE—Treas. Dpt. at office Sup. Archt., sketches U. S. Post Office, $65,000.

Calif., Monterey — BREAKWATER — U. S. Eng., Custom House, San Francisco, 1,300 ft. rock mound breakwater, from point near westerly line of Presidio. $200,000 available. Total $600,000.

D. C., Wash.—COAST GUARD—Treas. Dpt. at office Sup. Archt., plans by Bennett, Parsons & Frost, 80 East Jackson Blvd., Chicago, Ill., U. S. Coast Guard Building, Constitution and Pennsylvania Ave., 6th and 7th Sts. $3,000,000.

D. C., Wash. — HEATING PLANT — Treas. Dpt. at office Sup. Archt., plans by United Engineers & Constructors, Inc., 112 North Broad St., Phila., Pa., central heating plant, 5 mi. 3-to 18-in. underground pipes, etc. to heat 26 buildings. $5,749,000.

Ill., Carlinville—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, $75,000.

Ill., Carrollton—POST OFFICE—Treas. Dpt. at office Sup. Archt., sketches U. S. Post Office, $65,000.

Ill., Hillsboro—POST OFFICE—Treas. Dpt. concrete, brick, stone post office, $75,000.

Ill., Lawrenceville — POST OFFICE — Treas. Dpt. at office Sup. Archt., plans post office, $100,000.

Miss., Lamar—POST OFFICE—Treas. Dpt. at office Sup. Archt., plans U. S. Post Office.

Texas—DREDGING—U. S. Eng., Galveston, soon takes bids improving, dredging channel from Brownsville to Port Isabel, incl. turing basin. $5,500,000.

BIDS ASKED

Arizona—ROAD—May 21, by C. H. Sweetser, dist. engr., U. S. Bur. P. Rds., 508 Ellis Bldg., Phoenix, Ariz., grading 13.662 mi. Sect. B, Clint's Well-Moqui Ranch Hy., Coconino Co.

California and Nevada—ROAD—May 21, by C. H. Sweetser, dist. engr., oiling existing crushed rock surfacing 14.800 mi. Topaz National Forest Park, Mono and Douglas Counties.

D. C., Wash.—EXCAVATION—May 18, by Treas. Dpt. at office Sup. Archt., preliminary excavation for Archives Building.

D. C., Wash.—OFFICE—May 19, by Treas. Dpt. at office Sup. Archt., clearing site for Interstate Commerce Commission Building. Noted Feb. 5.

D. C., Wash.—PARKWAY—June 3, by Pub. Rds., Dpt. Agriculture, Willard Bldg., Unit 2, Colonial Natl. Monument Parkway; adv. E.N.-R. May 14.

Florida—BEACONS—May 25, by Dpt. Commerce, Div. Purchase & Sales, electric airway beacons on Jacksonville-Florence Sect., Jackson-Richmond Airway, Specs. 425 and 375.

Fla., Lake Okeechobee—CORE DRILLING—May 25, by U. S. Eng. Jacksonville, core drilling in Lake Okeechobee; adv. E.N.-R. May 14.

Idaho—ROAD—May 19, by Dpt. Agriculture, Pub. Rds., Ogden, Utah, clearing, grubbing, grading 187,700 cu.yd. Idaho City-Lowman Rd., Natl. Forest Rd. Project 25-B, Boise Natl. Forest, Boise Co.—steel bridge, approaches Elk City Hy., Natl. Forest Rd., Project 18-A", Nezperce Natl. Forest, Idaho Co.

Ind., Vincennes—MEMORIAL—June 25 (extended date), by George Rogers Clark Sesquicentennial Comn., State House, Indianapolis, Ind., constructing George Rogers Clark Memorial, F. C. Hirons & F. W. Mellor, 40 East 49th St., New York, archts.; adv. E. N.-R. May 14. Noted Apr. 16.

Ky., Louisville—ELEVATOR PLANT—June 1, by Treas. Dpt. at office Sup. Archt., elevator plant, in U. S. Post Office, Court and Custom House.

La., Opelousas—POST OFFICE—June 4, by Treas. Dpt. at office Sup. Archt., extending remodeling U. S. Court House and Post Office; adv. E.N.-R. May 14. Noted Mar. 5.

La., Shreveport—INCINERATOR—June 9, by Con. Q.M., incinerator at Barksdale Field; adv. E.N.-R. May 14.

Mass., Boston—CRANE—May 25, by Yards & Docks, Navy Dpt., gasoline operated locomotive crane, for marine railway, Navy Yard.

Mass., Westfield—POST OFFICE—June 2, by Treas. Dpt. at office Sup. Archt., remodeling extending U. S. Post Office; adv. E. N.-R. May 14.

Michigan—DREDGING—June 12, by U. S. Eng., Detroit, Courses 4, 5, 7 and 8, West Neebish Channel, St. Mary's River, and riprapping, fendering main breakwater at Harbor Beach; adv. E.N.-R. May 14. Noted May 7.

Mo., St. Louis—CLEARING SITE—Treas. Dpt. at office Sup. Archt., soon takes bids wrecking present buildings, clearing site for U. S. Federal Building, 12th Blvd. and Market St. Former bids rejected. Noted Jan. 1, 1930.

Nevada—ROAD—May 21, by C. H. Sweetser, dist. engr., U. S. Bur. P. Rds., 461 Market St., San Francisco, Calif., furnishing and applying binder and processing on crushed stone surfacing Sects. A and B, Route 3, Glenbrook Natl. Forest Hy., Douglas Co.

N. Y., Fort Ontario—HOSPITAL—June 2, at office Con. Q. M., post hospital additions; adv. E. N.-R. May 14.

N. C., Fort, Bragg—HOSPITAL—June 2, at office Con. Q. M., hospital; adv. E. N.-R. May 14.

O., Conneaut—DREDGING—June 2, by U. S. Eng., Federal Bldg., Buffalo, N. Y., 163,000 cu.yd. in outer Conneaut Harbor.

Pa., Pittsburgh—LOCK GATES—June 5, by U. S. Eng., two upper and two lower lock gates of 2 leaves each for New Lock 4, Monongahela River; adv. E. N.-R. May 14.

S. C., Rock Hill—POST OFFICE, etc.—June 3, by Treas. Dpt. at office Sup. Archt., U. S. Post Office, Court House (except elevator); adv. E. N.-R. May 14.

Tenn., Chattanooga—ROAD—June 3, at office Con. Q. M. Fort Oglethorpe, 1225 James Bldg., road in National Cemetery; adv. E. N.-R. May 14.

Tenn., Memphis—DERRICK—May 21, by U. S. Eng., McCall Bldg., 10 ton steel whirler-derrick for handling sand and gravel on floating concrete plant.

Mo., Jefferson City—ATHLETIC FIELD—See "Contracts Awarded."

China, Shanghi—EMBASSY—State Dpt. bids about May 15 (selected list bidders), U. S. Embassy, $600,000. Noted Apr. 2.

CONTRACTS AWARDED

Ala., Decatur—POST OFFICE—Treas. Dpt. at office Sup. Archt., extending U. S. Post Office, to Adamson, Boylston & White, 1106 1st Ave. N., Birmingham, $10,400. Noted Apr. 30.

Ala., Tuscaloosa—WATER TANK—Vet. Bu., Arlington Bldg., steel water tank, tower, to Chicago Bridge & Iron Co., 1616 Walnut St., Phila., Pa., $7,840; refrigerating system, to York Ice Mchy. Corp., 1238 North 44th St., Phila., Pa., $16,420; elevators, to Moffatt Machine & Mfg. Co., Charlotte, N. C., $18,450. Grand total $42,710. Noted May 7.

Idaho — ROAD — Pub. Rds., Ogden, Utah, grading, surfacing roadbed 5.4 mi. Banks-Garden Valley Natl. Forest Rds in Payette Natl. Forest, Boise Co., to Campbell Constr. Co., Newhouse Bldg., Salt Lake City, $82,300. Est. $104,000. Noted Apr. 25 Daily.

Ill., Great Lakes—MESS HALL—Spec. 6433—Yards & Docks, Navy Dpt., mess hall extension, to Anderson & Co., 1632 West 75th St., Chicago, $41,000.

Louisana — LEVEE—U. S. Eng., New Orleans, to Grasser Contg. Co., Amer. Bank Bldg., New Orleans, 950,000 cu.yd. Item L860-A, Plaquemine Point Levee $112,005, 970,000 cu.yd. Item L860-B, same levee $114,363; to Lower Coast Constr. Co., Godchaux Bldg., New Orleans, 150,000 cu.yd. Oneida Levee $16,500, 565,000 cu.yd. Garyville Levee $62,150, 370,000 cu.yd. Sugar House Point $40,700, 90,000 cu.yd. Item L913, College Point Levee $9,900, 175,000 cu.yd. Bowden Levee $19,250, all foregoing in Pontchartrain Levee Dist., 560,000 cu.yd. Carroll Levee, $61,600, 125,000 cu.yd. Star Levee $13,750, 340,000 cu.yd. Columbia Levee $37,400, 495,000 cu.yd. Winchester Levee $54,450, 130,000 cu.yd. Waterford Levee $14,300, all foregoing in Lafourche Levee Dist., 150,000 cu.yd. Fairview Levee, Lake Borgne Levee Dist. $16,500; 520,000 cu.yd. Lower Morgana Levee,

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Federal Government (Continued)

Atchafalaya Front Levee Dist., by government plant and hired labor, $76,410. Grand total $649,278. Noted Apr. 2.

Miss., Vicksburg—PAVING—Superintendent National Military Park, concrete paving 1.75 mi. in National Military Park, 18 ft. to Harbert, Carsule Constr. Co., Birmingham, Ala., $33,020.

Mo., Jefferson Barracks—ATHLETIC FIELD—Con. Q.M., athletic field, stadium by purchase and hire. Private plans.

N. J., Hoboken—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to Quaker City Masonry Constr. Co., 65th and Allam Sts., Phila., Pa., $220,900 (480 days); elevator, to Kerscher Elevator Co., 918 Michigan Ave., Toledo, O., $6,510. Noted Apr. 2.

N. Y., Lyons—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to S. Plato, 608 West Walnut St., Louisville, Ky., $48,269 (360 days). Noted Apr. 9.

N. D., St. Johns—INSPECTION STATION—Treas. Dpt. at office Sup. Archt., inspection station, to C. G. Steen Co., Grand Forks, $43,844. Noted Apr. 16.

Pa., Chambersburg—POST OFFICE—Treas. Dpt. at office Sup. Archt., remodeling, enlarging U. S. Post Office, to General Eng. Corp. of Pennsylvania, Upper Darby, $17,000. Noted Apr. 9.

Tex., Fort Sam Houston—QUARTERS—Con. Q.M., quarters, to R. E. McKee, 1918 Texas St., El Paso, $213,036. Noted Mar. 12.

Tex., Texas City—DREDGING—U. S. Eng., Galveston, 795,000 cu.yd. dredging extension Texas City channel to Atlantic, Gulf & Pacific Co., Galveston, $0.067. Noted Apr. 28 Daily.

Wyo., Sheridan—POST OFFICE—Treas. Dpt. at office Sup. Archt., U. S. Post Office, to W. MacDonald Constr. Co., Railway Exch. Bldg., St. Louis, Mo., $24,449 (180 days). Noted Apr. 9.

RAILWAYS

CONTRACTS AWARDED

Texas—Emery, Peck & Rockwood Development Co., Marble Falls, and Austin, laying 5 mi. standard gage railway line from Marble Falls to dam (now under construction), to E. R. Breaker, 510 Cumberland Rd., and A. Blomeyer, 109 East Hollywood St., both San Antonio. Noted Jan. 29.

Ontario—Canadian Natl. Rys., C. S. Gzowski, Montreal, Que., ch. engr. system, cut-off in Fort William, incl. grading, trestling, substructures, 2 bridges, 1 over Canadian Pacific Ry. and other over hy., to Chambers, McQuigge & McCaffrey, Port Arthur. Est. $300,000.

SUBWAYS AND TUNNELS

PROPOSED WORK

N. Y., New York—Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., recalled bids to have been opened May 10, Sect. 9, Route 101, Rapid Transit R.R. under 6th Ave. from West 43rd to West 53rd Sts. **Maturity 1933.** Noted Apr. 30.

Ont., Scarboro — Canadian Natl. Railways, T. I. Irving, ch. engr., New Union Sta., Toronto, plans subways, concrete abutments and retaining walls, earth excavation, steel spans, at Kennedy Rd., Midland Ave. and St. Clair Ave. $150,000.

BIDS ASKED

Calif., Sacramento—May 21, by H. G. Denton, city clk., H Street Subway, incl. one hundred and seventy-nine 30 ft. untreated wooden piles, 7,250 cu.yd. excav., 700 cu.yd. backfill, 9,000 cu.yd. bow levee fill, 35,000 lb. reinforcing steel and mesh, 950 cu.yd. Class A and 580 cu.yd. Class B concrete, 55.25 tons 33 in. steel girder beams, for City, $90,000. F. J. Klaus, city engr.

Pa., Phila.—May 19, by Dpt. City Transit, City Hall Annex, C. E. Myers, dir., Broadway Street Subway, West Philadelphia Branch, Contr. 323, incl. rail splice bars, bolts nutlocks, 36,200 screw spikes, 423 tons rail (100 lb. rail 62 ft. lengths).

Pa., Phila.—May 19, by City Transit, City Hall Annex, A. Murdock, dir., Broadway St. Subway, West Phila. Branch, Contr. 324, special track work and channels at Ridge Ave. and 8th St., switches, frogs, crossings, rail steel channels, separators, joint plates, bolts, nuts, washers.

GRADE CROSSINGS

PROPOSED WORK

N. J., Elizabeth—Central R.R. of New Jersey, A. E. Owen, ch. engr., Jersey City, preliminary plans 19 grade crossing projects for 4 or 5 year construction program. First unit matures after June 1. To exceed $10,000,000.

N. Y., Unadilla—Delaware & Hudson R.R. Co., J. MacMartin, ch. engr., Albany, soon takes bids eliminating Potters Crossing, $144,200.

BIDS ASKED

California—May 27, by C. H. Purcell, engr. State Hy. Comn., Sacramento, undergrade crossing under tracks Southern Pacific R.R. near Henderson Station, San Mateo Co., incl. 2 concrete abutments with wing walls, drainage system, pumping equipment, grading, concrete paving 0.4 mi. roadway.

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CONTRACTS AWARDED

N. Y., Barker—Delaware, Lackawanna & Hudson R.R. Co., G. J. Ray, ch. engr., Hoboken, N. J., eliminating Adams Street Crossing, to Park & Graham, 50 Church St., New York, $66,485.

N. Y., Chenango Forks — Delaware, Lackawanna & Hudson R.R. Co., G. J. Ray, ch. engr., Hoboken, N. J., eliminating Gulf Bridge County Hy. Crossing, to Park & Graham, 50 Church St., New York, $57,485.

N. Y., Pine Valley — Pennsylvania R.R. Co., T. J. Skillman, ch. engr., Broad St. Sta., Phila., Pa., reconstructing bridge, 2 mi. from here, to O. M. Luddington & Sons, Inc., Powers Bldg., Rochester, $23,895.

N. Y., Raspheu — Erie R.R. Co., G. S. Fanning, 50 Church St., New York, eliminating Younger Crossing, to W. L. Collins, Horneli, $21,305.

DAMS

PROPOSED WORK

Que., St. Stanislas—See "Waterworks."

PIERS AND WHARVES

PROPOSED WORK

La., New Orleans — WHARVES — Dock Bd. placing concrete slab on second floor, placing roofing, steel, on Bienville Street Wharf, $40,000; constructing 2 office buildings, garages, comfort station for city delivery shed at Bienville Street Wharf, $175,000.

AIRPORTS

CONTRACTS AWARDED

Pa., Pittsburgh—Allegheny Co., R. G. Woodside, controller, airport buildings, incl. 2 story, 73 x 114 ft. brick, terra cotta administration building, 1 story, 30 x 197 ft. brick auxiliary building, 2 story, 105 x 152, hangar building, near here, to J. P. Ramella, 1625 Port Vue St., McKeesport, $172,253. Noted Apr. 16.

GRAIN ELEVATORS

BIDS ASKED

Tex., Fort Worth—GRAIN ELEVATORS—See "Contracts Awarded."

CONTRACTS AWARDED

Tex., Blackwell—GRAIN ELEVATOR—Blackwell Mill & Elevator Co., c/o D. Mixson, mgr., rein.-con. storage elevator, plain found., 500,000 bu. capacity, 14 large tanks, 22 smaller tanks, 100 ft. high, storage tanks, covering 60 x 100 ft. area, 16,000 cu.yd. excav., for found., 150 carloads rock for found., to Burrell Eng. & Constr. Co., North Canal St., Chicago, Ill., $100,000.

Tex., Fort Worth—GRAIN ELEVATORS—Fort Worth Elevators & Warehousing Co., 1510 East 1st St., 3,000,000 bu. grain elevator, rein.-con., to Southwestern Eng. Co., McDaniel Bldg., Springfield, Mo. Soon takes bids excavation work.

POWER AND LIGHTING

PROPOSED WORK

Calif., Sacramento—City Council ornamental street lighting system on K St. $25,000 or more. F. J. Klaus, city engr.

Calif., Stockton — City Council ornamental street lighting system in downtown business streets. $25,000 or more. Work will be financed by property owners.

Mo., Centralia—Missouri Power & Light Co., 740 Bd. Trade Bldg., Kansas City, natural gas distribution system. 20 year Franchise voted. Private plans.

Okla., Hobart — City Council, preliminary plans natural gas distribution system. $30,000. C. R. Williams, mayor.

Okla., Lamont—City Council, A. Suttergreen, mayor, franchise election May 26, electric distribution system to Oklahoma Gas & Electric Co., Insurance Bldg., Oklahoma City. $30,000. Byllesby Eng. Co., 231 South La Salle St., Chicago, Ill., engrs.

Tex., De Leon—City, plans municipal natural gas system. $80,000. Election soon for same. Address City Engineer.

Tex., Rising Star — City, plans municipal natural gas system, incl. plant, distributing lines, etc. $75,000. Address City Commissioners.

Tex., Stephenville—Land & Royalty Corp., G. D. Terrian, vice-pres. and genl. mgr., Philcade Bldg., Tulsa, Okla., granted 25 year franchise by city, and plan 15 mi. 6 or 8 in. gas line from X-ray pool, to Stephenville, incl. distributing lines inside city limits. $150,000. Private plans.

Ont., Oshawa — Lake Shore Gas Co., Richmond and Simcoe Sts., installing gas retorts, $25,000; erecting storage building, $10,000; laying gas mains to Whitby and Boumanville, $100,000; extending mains in Oshawa and Boumanville. $20,000.

Ont., Oshawa—Ontario Shore Gas Co., W. Chatfield, mgr., Genosha Hotel, purchased gas plant and plan extending system, mains, also new water gas generator. $100,000. Private plans.

BIDS ASKED

Utah—See "Contracts Awarded."

CONTRACTS AWARDED

Texas—Central Power & Light Co., San Benito, and Frost Bldg., San Antonio, 20 mi. transmission line, single creosoted pole with double cross arms carrying 3 aluminum conductors, insulated for 66,000 volts between San Benito and Brownsville, to Southwest L. E. Myers Co., Allen Bldg., Dallas, and Del Rio.

Utah—Utah Gas & Coke Co., 45 South Main St., 45 mi. 8 and 10 in. gas mains from Midvale to Pleasant Grove and from Provo City to Spanish Fork, day labor. $1,000,000. Work begun. J. Roberts, Salt Lake City, engr.

PARKS AND SPORTS

PROPOSED WORK

Calif., Los Angeles—City Playground & Recreation Dpt., R. E. Hoyt, supt., 2 swimming pools, each 18 meters wide, 50 meters long, rein.-con., and 1 wood grandstand, 5,000 seating capacity, for Exposition Park for Olympic Games.

Ind., Indianapolis — Indiana Baseball Club, W. Clauer, secy., 1235 West Washington St., preliminary plans baseball park, 16th and North Harding Sts. $350,000.

Me., Windham—Town, F. Aikens, sketches by G. C. Robinson, Westbrook, gymnasium, auditorium. $25,000 or more. Noted Mar. 26.

Mass., Boston—City, Park Dpt., plans by J. G. McGann, 129 Newbury St., and soon takes bids 1 story, basement, brick, stone antelope house, Franklin Park. $68,700.

N. Y., Brooklyn—Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, appropriated $349,000, for filling, landscaping Marine Park. Total $40,000,000.

N. Y., Port Richmond—J. A. Lynch, pres. Richmond Boro, Boro Hall, bids after May 15, 1 story, basement outdoor baths, Saber Park, $300,000. Sibley & Fetherston, 205 East 42nd St., New York, archts.

Tex., San Antonio—See "Clubs."

BIDS ASKED

New York—May 19, by Park Bd., W. R. Herrick, pres. Park Dpt., Arsenal Bldg., Central Park, New York, sidewalks, parking space adjacent to Victory Field, Forest Park, improving east side Shore Rd, between 4th Ave. and Fort Hamilton Parkway.

Okla., Tulsa—May 18, by Bd. Comrs. Tulsa Co., timber grandstand for Tulsa Co. Fair, $175,000. Smith & Senter, 307 Philtower Bldg., archts. S. R. McClelland, Court House, engr. Noted May 7.

CONTRACTS AWARDED

Conn., Litchfield — Litchfield Community House, Inc., athletic field, incl. baseball diamond, football gridiron, tennis courts, necessary filling, grading, drainage, to F. Fabbri, Litchfield, $19,000. Noted Mar. 26.

Ia., Spencer—Clay Co. Fair Assn., 75 x 250 ft., concrete, steel grandstand, 4,400 seating capacity, to Spencer Constr. Co., Spencer, $49,335. Est. $50,000. Noted Mar. 26.

Mo., Jefferson Barracks—ATHLETIC FIELD—See "Federal Government."

N. J., Clifton—Elco Realty, Inc., C. Cole, in charge, 253 Bellevue Ave., Montclair, 75 x 165 ft., rein.-con., tile swimming pool, to Lyman Bros., 119 Midland Ave., Glen Ridge. Est. $25,000.

N. Y., New York—Hollywood Pools, Inc., 101 Park Ave., will build 2 story, 30 x 240 ft. pool, showers, separate contracts, $70,000. J. Brown, 101 Park Ave., archt. Noted Apr. 30.

HEATING AND VENTILATING

PROPOSED WORK

Vt., Bennington—State, State House, Montpelier, preliminary plans heating plant in Soldiers Home. $40,000. F. L. Austin, 240 College St., Burlington, archt. and engr.

CONTRACTS AWARDED

Mass., Lynn—New England Telephone & Telegraph Co., 50 Oliver St., Boston, heating in exchange building, Essex and Washington Sts., to J. C. Cassidy, 133 Austin St., Cambridge, plumbing, to W. H. Mitchell Co., 90 Arch St., Boston, elevators, to Gurney Elevator Co., Inc., 31 State St., Boston, est. $25,000; electrical work, to H. M. Haley Electric Co., 165 Pearl St., Boston. Noted May 7, under "Buildings—Unclassified."

N. J., Skillman—Dpt. Institutions & Agencies, State Office Bldg., Trenton, steam distribution system at power house, State Village for Epileptics, to G. J. Tobin, 187 North Ave., Plainfield, $37,217. Noted Mar. 16 Daily.

UNCLASSIFIED

PROPOSED WORK

Ill., O'Fallon—MINE TIPPLE and EQUIPMENT—Perry Coal Co., rebuilding mine tipple recently destroyed by fire, incl. new equipment. $75,000. Private plans.

R. I., Providence — COMFORT STATION — City, Pub. Building Dpt., comfort station, Roger Williams Park, near Reservoir Ave. $25,000. T. J. H. Pierce, City Hall, engr.

Ont., West Lorne—Council waterworks, standpipe, pumping station. $75,000. C. R. Hagey, Bridgeburg, engr.

Ont., Petrolea—STORAGE TANKS—Canadian Oil Companies, Ltd., C. A. Haile, ch. engr., new wax still, steel storage tanks, condensers, $25,000.

Unclassified (Continued)

BIDS ASKED

Mass., Boston—PEDESTAL, etc.—May 15, by Art Comn., 15 Beacon St., granite pedestal and platform at Henry Cabot Lodge Memorial, $25,000 or more. Putnam & Cox, 114 State St., archts.

Mass., Boston—STATION PLATFORM—May 18, by City, Transit Dpt., 1 Beacon St., 1 story, concrete station platform, canopy, Dorchester Rapid Transit St., near Butler St., Dorchester.

N. Y., New York—STATION FINISH WORK—May 19, by Bd. Transportation, J. H. Delaney, chn., 250 Hudson St., station finish work for Kingsbridge Rd. and Bedford Park Stations of Rapid Transit R.R.

CONTRACTS AWARDED

Texas—PIPE LINE—Sinclair Oil Co., Sinclair Bldg., Tulsa, Okla., furnishing 150 mi. 12 in. and 40 mi. 8 in. steel pipe, involving 35,000 tons pipe for pipe line in east and middle fields of Texas, to Jones & Laughlin Steel Corp., Ross St., Pittsburgh, Pa., $1,500,000. Noted Mar. 19.

MATERIALS

BIDS ASKED

TAR, OIL, etc.—**Louisville, Ky.**—May 21, by B. B. Kelly, purch. agt. Jefferson Co., 500,000 gal. medium tar, 500,000 gal. cut-back oil, 100,000 gal. tar cold patch, 100,000 gal. cut back asphalt for cold patch, all material to meet with Kentucky's 1930 Standard Specifications. M. Drane, Court House, engr.

ROOFING TILE—**Jackson, Miss.**—May 23, by Bd. Comrs. State Hosptial Removal Comn., furnishing 6 x 15 roofing tile for 11 buildings, $15,000. N. W. Overstreet, engr.

TRAP ROCK—**Englewood, N. J.**—May 25, by Palisades Interstate Park Comrs., L. Deyo, purch. agt., 141 Worth St., New York, 8,400 cu.yd. washed hard trap rock by truck to Henry Hudson Drive Sect. 1 between Englewood Landing and Alpine. $5,000. Private plans.

ROAD OIL, etc.—**Long Island City, N. Y.**—May 21, by G. U. Harvey, pres. Queens Boro, Queens Subway Bldg., 200,000 gal. road oil, cold application, spread on dirt roads; 50,000 cu.yd. steam ashes.

STEAM CINDERS, etc.—**New York, N. Y.**—May 21, by H. Bruckner, pres. Bronx Boro, Crotona Park, 3rd and Tremont Aves., 30,000 cu.yd. steam cinders; 10,000 bags portland cement; 4,000 cu.yd. sand grit; 2,000 cu.yd. concrete and paving sand.

STONE, etc.—**St. George, N. Y.**—May 20, by J. A. Lynch, pres. Richmond Boro, Boro Hall, 500 cu.yd. ¾ in. broken stone 8-8, and 300 cu.yd. screenings, in Dists. 1 and 2.

ROAD OIL and ASPHALT — **Edwardsville** (Wilkes Barre P. O.), **Pa.**—May 18, by R. S. Moran, Boro Council, furnishing road oil in 10,000 gal. lots, Kentucky asphalt or equivalent material in car load lots. J. A. Boyle, 71 2nd Ave., Kingston, engr.

STEEL WHEELS—**Phila., Pa.**—May 20, by C. E. Walsh, purch. agt. Pennsylvania R.R. Co., 15 North 32nd St., steel wheels, Contr. 15—1931.

CONTRACTS AWARDED

BELL and SPIGOT PIPE, etc.—**Gridley, Calif.**—J. L. Lewis, city clk., 1,500 ft. 6 in. and 2,000 ft. 4 in. c.i. bell and spigot pipe, miscellaneous fittings, to Pacific States Cast Iron Pipe Co., 111 Sutter St., San Francisco, $2,004.

STRUCTURAL STEEL—**Sioux City, Ia.**—Bd. Comrs. Woodbury Co., 348,016 lb. structural steel for 22 I-beam bridges, f.o.b. various points in county, to Omaha Steel Wks., 609 South 48th St., Omaha, Neb., $9,179.

ASPHALT ROAD OILS, etc.—**Boston, Mass.**—Commonwealth Massachusetts, Administration & Finance, asphalt road oils and tar as specified, to Trimount Oil Co., 1840 Bway., Everett, $8,165 and $7,258 respectively; asphalt road oil, Sect. B and C, to Standard Oil Co., Park Sq. Bldg., $18,631 and $13,473 respectively; asphalt road oils, Sect. A, to Texas Co., Park Sq. Bldg., $13,028. Grand total $60,555.

BINDER STONE—**Detroit, Mich.**—Dpt. P. Wks., City Hall, 70,000 tons binder stone, to Lake Ports Supply Co., 1917 Penobscot Bldg., at $1.32 per ton, total $92,400.

BRICK and TILE — **Jackson, Miss.** — See "Hospitals."

ROAD OIL—**Providence, R. I.**—State Bd. P. Roads, State Office Bldg., asphaltic oil or refined tar as specified, to C. C. Plumb Co., 150 Toronto Ave., $6,300.

EQUIPMENT

PROPOSED WORK

MIXING EQUIPMENT—**Grand Forks, N. D.**—City plans chemical mixing equipment and sludge pump. $3,800. E. L. Lium, city engr.

BIDS ASKED

PUMP and MOTOR—**Manhattan Beach, Calif.**—May 21, by M. J. Crandall, city clk., 600 g.p.m. turbine pump with motor.

ROAD MAINTAINER—**St. Paul, Minn.**—May 19, by C. A. Carlson, city purch. agt., 1 multiple-blade road maintainer. W. N. Carey, city engr.

FOREIGN

Cape Verde Island, Praia—June 1, by Dpt. P. Wks., 5,100 meters, 40 mm. and 1,500 meters of 60 mm. mannesinann steel tubes; 750 kg. lead for packing; six 40 mm. sluice valves; three 40 mm. vertical ventilating valves and six 60 mm. sluice valves, connections, etc.

New Zealand, Dunedin—May 27, by City Tramway Bd., 150 tons rails and fish plates.

Commercial Buildings

RESIDENTIAL

BIDS ASKED

Calif., Oakland—See "Contracts Awarded."

N. J., Bradley Beach—See "Contracts Awarded."

N. J., Jersey City—See "Contracts Awarded."

N. Y., Brooklyn—See "Contracts Awarded."

N. Y., Flushing—See "Contracts Awarded."

N. Y., New York—See "Contracts Awarded."

N. Y., Yonkers—See "Contracts Awarded."

CONTRACTS AWARDED

Calif., Oakland—G. Lloyd, c/o L. Ford, archt., 1435 Harrison St., steel, brick, 17th and Jefferson Sts., separate contracts under supervision architect. Est. $150,000.

N. J., Bradley Beach—R. W. Siens, 178 Gregory Ave., West Orange, 3 story, basement, brick, steel, separate contracts. $150,000. F. Immen, 310 La Reine Ave., Asbury Park, archt.

N. J., Jersey City—Gorlin Constr. Co., H. Goldowsky, 23 Warner Ave., 5 story, basement, 98 x 118 ft., brick, steel, 168-72 Jewett Ave., separate contracts. $250,000. M. Kraut, 3010 Hudson Blvd., archt.

N. Y., Brooklyn—Bedford Realty Corp., G. Goldberg, pres., 6 story, 90 x 120 ft., Bedford Ave. and Glenwood Rd., separate contracts. $160,000. M. Hirsch, 350 Stone St., archt.

N. Y., Brooklyn—W. M. Calder Co., 2703 Avenue U, apartment, Coyle St. and Avenue T, separate contracts. $165,000. J. M. Boyle, 367 Fulton St., archt.

N. Y., Brooklyn—Fenimore Constr. Co., 26 Court St., 6 story, 75 x 94 ft., Fenimore St. and Flatbush Ave., separate contracts. $150,000. Cohn Bros., 215 Montague St., archts.

N. Y., Brooklyn—S. Kleinrock, 1548 East 27th St., 6 story, 67 x 108 ft. apartment, Ocean and Church Aves., by separate contracts. $180,000. Franklin, Bates & Heimdsmann, 2526 Webster Ave., New York, archts.

N. Y., Brooklyn—J. C. Building Corp., 291 East 3rd St., 6 story, 100 x 210 ft., brick, steel, Ocean and Caton Aves., separate contracts. $475,000. Seelig & Finkelstein, 153 Pierrepont St., archt.

N. Y., Brooklyn—J. Katz, 1830 East 4th St., apartment, Avenue T and East 35th St., separate contracts. $250,000. I. Kallich, 26 Court St., archt.

N. Y., Brooklyn—Mayo Beck Realty Corp., 8 Mayo St., 6 story store, apartment, Brighton Beach Ave. and Mayo St., separate contracts. $300,000. **Maturity soon.** M. Marlo, 200 Berkeley Rd., archt.

N. Y., Brooklyn—O'Heller Contr. Co., 1152 East 24th St., 6 story, 100 x 101 ft., Ocean Ave. and Avenue R, separate contracts and day labor. $180,000. Seelig & Finkelstein, 153 Pierrepont St., archts.

N. Y., Brooklyn—Manner Building Corp., S. Freedman, pres., 434 84th St., apartment, 78th St. and 6th Ave., separate contracts. $150,000. Cohn Bros., 215 Montague St., archts.

N. Y., Brooklyn—Parocean Building Corp., 510 Ditmars Ave., 6 story, 84 x 240 ft., Humbert St. and Brighton Beach, separate contracts. $350,000. Cohn Bros., 215 Montague St., archts.

N. Y., Brooklyn—M. Pone, 249 Elder St., 6 story, 60 x 85 ft., brick, 84th St. and 7th Ave., separate contracts. $150,000. F. W. Denny, 1448 Bedford Ave., archt.

N. Y., Brooklyn—Polblock Realty Corp., I. Polimick, pres., 451 Albany Ave., 6 story, 97 x 130 ft., President St. and Rochester Ave., separate contracts. $200,000. Cohn Bros., 215 Montague St., archts.

N. Y., Brooklyn—Zarfnig Realty Co., D. Lazar, pres., 10 Ocean Parkway, 6 story, 90 x 90 ft., Bay Parkway and 79th St., separate contracts. $198,000. J. J. Millman, 67 Court St., archt.

N. Y., Flushing—Atlas Constr. Co., 26 Court St., Brooklyn, 6 story, 79 x 100 ft. apartment, Ash and Bowne Aves., separate contracts. $150,000. B. Braunstein, 163-18 Jamaica Ave., Jamaica, archt.

N. Y., Forest Hills—S. Sink, apartment, Heirick and Austin Sts. Separate contracts. $150,000. A. J. Richie, c/o owner, archt.

N. Y., New York—S. Lippman, 11 West 42nd St., 12 story, 75 x 100 ft., 310 East 55th St., separate contracts.

N. Y., New York—Two Hundred Ten East 76th Street Corp., 570 7th Ave., 6 story, basement, 210 East 75th St., separate contracts. $175,000. W. I. Hohauser, 17 West 44th St., New York, archt.

N. Y., New York—Two Hundred Twenty Third Street Realty Corp., 332 East 194th St., 5 story, apartment, 225th St. and White Plains Ave. Separate contracts. $150,000. J. L. Cransman, 332 East 149th St., archt.

N. Y., Yonkers—R. C. Associates, Inc., A. O. Hudson, 930 McLean Ave., apartment, Central Park Ave., near Churchfield St., separate contracts. To exceed $200,000. **Maturity about July.** G. A. Herbst, c/o owner, archt.

CLUBS

PROPOSED WORK

N. J., Jersey City—Polish American Democratic Club, 176 Pavonia Ave., new sketches to A. Davis, 140 Montgomery St., 2 story, basement, 50 x 100 ft., brick, steel, plans found. Liberty St. and St. Pauls Ave. $150,000. Noted Jan. 29.

N. J., Newark—J. Centanni, archt., 142 Market St. soon lets contract general contract 2 story, basement, brick, steel, rein.-con. club house Summer Ave. and D'Auria St., for Italian Catholic Union Holding Co., c/o architect. $150,000. Noted Apr. 30.

N. Y., Port Richmond (mail Staten Island)—Loyal Order of Moose, J. J. Daly, dictator, 110 Park Ave., plans 2 story, basement, brick, steel, club house, Park Ave. $150,000. Architect not selected.

Tex., San Antonio—Longhorn Athletic Club, E. H. Kifer, pres., c/o San Antonio Pub. Serv. Co., preliminary sketches by A. B. and R. M. Ayres, South-Young Tower, 14 story, basement, 118 x 180 ft. clubhouse, 16,000 sq.ft. floor space, incl. shops, clubrooms, bowling alleys, gymnasium, track, swimming pool, Turkish and Swedish baths, Villita St. $1,000,000.

CONTRACTS AWARDED

Ill., Chicago—Michaelson & Rognstad, archts., 3256 Franklin Blvd., general contract 29 story club, motorists hotel and shopping and automobile serving center, 24th St. and Michigan Ave., to S. S. Joy, 180 North Michigan Ave., for Motorists Assn. of Illinois, 3252 South Michigan Ave., H. Meyer, secy. Est. $1,500,000. Noted Jan. 15, under "Contracts Awarded."

HOSPITALS

PROPOSED WORK

Mass., Boston—City, Institutions Dpt., soon takes bids 2 story, basement, brick, recreation building, concrete found., at Long Island Hospital, $200,000. McLaughlin & Burr, 88 Tremont St., archts.

N. Y., Buffalo—Sisters of Charity, 1833 Main St., plans by Dietel & Wade, Genesee Bldg., hospital, Main St. and Kensington Ave. $1,000,000.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., bids late in June, general contract hospital, at Harlem Hospitals, $1,500,000. Sloan & Robertson, 420 Lexington Ave., archts. Noted Jan. 8.

BIDS ASKED

N. J., Holmdel—May 21, by Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 2 story, basement, brick, steel nurses home, at New Jersey State Hospital. $150,000. Div. Architecture & Constr., State Office Bldg., Trenton, archts.

N. J., Preakness—Bd. Freeholders, Passaic Co., Court House, Paterson, bids about June 1, general contract 3 story, basement, brick, steel, rein-con. welfare house, detention home, Oldham Rd. $750,000. F. W. Wentworth, 140 Market St., Paterson, archt. Noted Mar. 12.

CONTRACTS AWARDED

Calif., Altadena — Sisters of St. Joseph, Orange, group rein.-con. hospital buildings, to Barrett & Hilp, 918 Harrison St., San Francisco, $750,000. Noted May 7.

Ill., Rock Island—Cervin & Stuhr, archts., Safety Bldg., general contract 3 story, basement, 42 x 150 ft., rein.-con., brick, steel sanitorium building, incl. living quarters, dining room, laboratories, operating rooms, plain found., to Stoehr & Palmgren, 2129 16th St., Moline, for Rock Island County Tuberculosis Assn., 1037 21st St., L. Ostrom in charge. $83,396. Noted Jan. 22.

Miss., Jackson—Bd. Comrs. State Hospital Removal & Imprv. Comn., furnishing brick for 11 hospital buildings, to Louisville Brick Co., Louisville, Brookhaven Brick Co., Brookhaven, Johnson-Cone Brick Co., Jackson, and to Meridian Brick Co., Meridian, total $40,000, furnishing tile for above buildings, to B. H. Hood Co., 686 Greenwood Ave. N.E., Atlanta, Ga., $30,000. Noted Apr. 9.

N. Y., Brooklyn—Trinity Hospital, 75 Sunnyside Ave., hospital, to G. F. Driscoll, 548 Union St. $225,000. Noted Mar. 26.

Ont., Penetanguishene — Dpt. P. Wks., G. Hogarth, deputy minister, Parliament Bldgs., Toronto, 2 story, basement, 60 x 176 ft., with two 30 x 200 ft. wings, concrete, steel, stone brick hospital unit, to Scholey Constr. Co., Chatham St. E., Windsor. Est. $250,000.

Que., Quebec City—Governors Jeffrey Hale Hospital, new concrete, stone hospital wing, to D. G. Loomis & Co. Ltd., 1130 St. Patrick St., Montreal. $250,000.

CHURCHES

BIDS ASKED

Kan., Baldwin—First Methodist Episcopal Congregation, C. E. Holman, pastor, soon lets contract 3 story, basement, 90 x 138 ft., concrete, brick, cast stone church. Felt Dunham & Kriehn, 300 West 47th St., Kansas City, Mo., archts.

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Churches (Continued)

N. J., Glen Ridge—Glen Ridge Congregational Church, Ridgewood Ave., revised plans by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel church, Sunday School. $250,000. Noted Feb. 19.

N. Y., New York—Metropolitan Temple, 91 7th Ave., will award contract June 1, church and Sunday school, 42 7th Ave., $225,000. Bids in. L. E. Jallade, 15 East 47th St., archt. Noted Jan. 1.

N. Y., New York — Collegiate Reformed Church of St. Nicholas, 5th Ave. and 48th St., plans parish house, 48th St., near 5th Ave. $150,000.

CONTRACTS AWARDED

Md., Baltimore—St. Joseph Monastery Parish, Old Frederick Rd. and Monastery Ave., 1 story, basement, granite, stone, steel church, Old Frederick Rd. and Monastery Ave., to McCloskey & Co., 1620 West Thompson St., Phila., Pa., $200,000. Noted Apr. 9.

N. J., Keansburg — V. J. Eck, archt., 155 Broad St., Red Bank, general contract 2 story, basement, brick, steel convent, to A. Domorski, 665 Cameron Rd., South Orange; heating and plumbing, to G. W. Stillwell, 102 Market St., Perth Amboy. Est. $150,000. Noted Apr. 23.

N. Y., New York—Hellenic Eastern Orthodox Church, 46 East 92nd St., church, to R. H. Howes, 103 Park Ave., New York. Est. $300,000. Noted Apr. 16.

SCHOOLS

PROPOSED WORK

Ark., Jonesboro—Arkansas Agricultural & Mechanical College for 1st Dist., V. C. Kays, pres., soon takes bids 4 story, basement, 150 x 256 ft., rein.-con., brick administration building in 3 units, incl. administration library and auditorium. $240,000. Petter & McAninch, Inc., Pyramid Bldg., Little Rock, H. Ray Burks, Wallace Bldg., Little Rock, and E. W. Mann, Cotton Exch. Bldg., Memphis, Tenn., assoc. archts.

Ark., Little Rock—University of Arkansas Medical School, c/o Bd. Trustees, soon takes bids 2, or 3 story, basement, concrete, brick, stone science building. $250,000. H. R. Burks, Wallace Bldg., archt.

Calif., San Rafael—Dominican College plans by A. Constable, 580 Market St., San Francisco, rein.-con. chapel, Locust St. $150,000.

Ill., Quincy—W. E. Shite, secy. Bd. Educ., Musselman Bldg., rejected bids Apr. 2, 3 story, basement, 224 x 310 ft. rein.-con., brick high school, incl. auditorium, gymnasium, swimming pool, laboratory, cafeteria, printing shop, 14th St. $1,350,000. Will probably revise plans and readvertise. Behrensmeyer & Haffner, W. C. U. Bldg., and J. D. Chubb, 109 North Dearborn St., Chicago, assoc. archts. Noted Feb. 19.

Ind., Michigan City—School Comrs. plans by S. P. Boonstra, Michigan City, 2 story, basement, rein.-con., brick, stone. $150,000.

Mass., Chicopee—City, H. Cloutier, mayor, J. J. Desmond, supt. Schools, trade school, Front St. $150,000. Architect not selected.

Mass., East Boston (sta. Boston)—City of Boston, Dpt. School Buildings, revised plans 2 story, basement, brick, limestone, plain found., Chapman Dist. $200,000. Noted Nov. 13.

Mass., Everett—City, School Building Comn., bids about May 15, altering and constructing 2 story, basement, brick, stone Adams School addition, plain found. $150,000. Desmond & Lord, 1 Beacon St., Boston, archts.

Mass., Lawrence — City, Superintendent Schools, sketches by J. G. Moriessette, 575A Essex St., 2 story, basement, brick, cast stone grade and kindergarten school, Chester and Bowdoin Sts. $150,000.

Mass., Lawrence—City, Superintendent Schools, sketches by Ashton Huntress & Alter, 477 Essex St., 2 story, basement, brick, cast stone, grade and kindergarten school, Trenton and Lexington Sts. $150,000.

Mass., Lawrence—City, Superintendent Schools, sketches by Higgins & Collins, 305 Central Bank Bldg., 2 story, basement, brick, artificial stone school, Pleasant and Woodland Sts. $150,000. Noted Oct. 9.

Mass., Winchester — Town, Bd. Selectmen, plans by R. C. Sturgis, 120 Boylston St., Boston, brick, steel school, Main St. $175,000. Noted Mar. 12.

Mass., Winchester — Town, Bd. Selectmen, sketches by R. C. Sturgis, 120 Boylston St., Boston, Junior High School, 2 story, basement, brick, Main St. $250,000 appropriated. Noted Feb. 19.

Mass., Winchester — Town, Bd. Selectmen, sketches by R. H. Doane, 60 Batterymarch St., Boston, 2 story, basement, brick, stone addition to high school, Main St. and Mystic Valley Parkway. $150,000. Noted Dec. 25.

Mich., Detroit—Detroit College of Law, Main Y.M.C.A. Bldg., plans by Architectural Dpt. Y.M.C.A., 420 Lexington Ave., New York, 8 story, basement, 80 x 90 ft., brick, steel, rein.-con., law college addition, plain found., John R. and Elizabeth Sts. $400,000.

Minn., St. Paul—College of St. Thomas, M. A. Schumacher, pres., Summit and Cleveland Aves., plans by Maginnis & Schaumberg, 614 Federal Trust Bldg., brick, steel, stone, science hall-library. $700,000.

Minn., Worthington — Bd. Educ., C. M. Leonard, clk., plans by Jacobson & Jacobson, 212 Wesley Temple Bldg., Minneapolis, 2 story, basement school, and 2 story, basement school addition, both rein.-con., brick, stone. $200,000. Noted Apr. 23.

Neb., Lincoln — Lincoln Diocese of Roman Catholic Church, c/o Bishop of Lincoln, soon takes bids 3 story, 197 x 216 ft., concrete, brick, stone high and grade school, G and 22nd Sts. $300,000. L. A. Daly, 622 Peters Trust Bldg., Omaha, archt.

N. J., Jersey City — Sacred Heart Roman Catholic Church, M. J. Ripple, pastor, Bayview and Jackson Avss., plans by Guilbert & Betelle, 20 Branford Pl., Newark, and bids about June, 4 story, basement, brick, steel convent, rectory, educational and social center, Bay View and Bidwell Ave. $500,000. Noted Apr. 23.

N. J., Jersey City—Church of Our Lady of Sorrows, E. Monteleone, pastor, 75 Claremont Ave., sketches 2 story, basement, 80 x 105 ft., brick, steel school, rectory, Claremont Ave. and Clark St. $150,000.

N. J., Morristown—Bd. Educ., 50 Early St., plans 2 story, brick, steel, school, Florham Park. $150,000. Architect not selected.

N. J., Union—Bd. Educ. plans by F. A. Elsasser, 1000 Stuyvesant Ave., Connecticut Farms School, Stuyvesant and Morris Aves. $200,000. **Maturity indefinite.** Noted Mar. 26.

N. J., Washington—Bd. Educ., C. C. Bowers, dist. clk., rejected bids Apr. 9, general contract 2 story, basement, 115 x 150 ft. high school, North Carlton Ave. $150,000. C. G. Jones, 133 Academy St., Belleville, archt. Noted Apr. 23.

N. Y., Brooklyn—St. Patrick's Roman Catholic Church, J. J. Kent, pastor, 95th St. and 4th Ave., plans altering 3 story, school, 4th Ave. and 95th St. $150,00. McKenna & Irving, 15 Park Row, New York, archts.

N. Y., Fayetteville—Bd. Educ., F. B. Crocker, chn., plans by C. Ade, 89 East Ave., Rochester, grade and high school. $380,000 voted. Noted Apr. 29 Daily.

N. Y., Hammels—Bd. Educ., 500 Park Ave., New York, School P. S. 164. $315,000.

N. Y., New York—Catholic Institute for Blind, J. G. Neser, soon lets contract 3 story institute, Paulding Ave. and 220th St. $150,000. R. J. Reiley, 12 East 41st St., archt. Noted Apr. 30.

Pa., Chester—Bd. Educ., C. E. Sanderson, secy., plans by C. S. Idell, 1510 Chestnut St., Phila., Junior High School, 7th St. and Central Ave. $175,000.

Pa., Pittsburgh—Bd. Educ., H. W. Cramblet, secy., Administration Bldg., soon takes bids general contract Mifflin Elementary School, 3 story, 90 x 230 ft., brick, stone, Lincoln Ave. and McAdams St. $250,000. Link, Weber & Bowers, 407 North Craig St., archts. C. L. Woolbridge, Fulton Bldg., consult. engr. Electrical work, awarded to W. C. Hemmerle Electric Co., 212 Olympia St., $9,365.

Tex., Donna—Bd. Educ., c/o H. B. Scott, pres., plans by Phelps & Dewees, Gunter Bldg., San Antonio, 2 story, brick, rein.-con. high school, rein.-con. found. $150,000. Noted Aug. 7.

Ont., Ottawa—Ottawa Public School Bd., 330 Gilmore St., plans by W. J. Jeffrey, 330 Gilmore St., addition to Connaught School, $30,000; Glashan School, $35,000; Hopewell School, 10-room addition and gymnasium, $75,000; Wellington St. School, gymnasium and auditorium, $20,000, all foregoing, concrete, brick, steel, stone, etc.

Ont., Toronto—Bd. Educ., plans by Darling & Pearson, 2 Leader Lane, 3 story, basement, brick, steel, concrete stone, marble, college of education, Bloor St., W. $175,000. Noted Feb. 19.

Que., Cote St. Pierre—School Comn. plans by Perry & Luke, 1190 University St., Montreal, new addition to Westhill High School. $300,000.

Que., Quebec City—Governors of Commercial Academy addition. $250,000.

Que., Quebec City—Roman Catholic Parish of St. Sacrament, girls' school. $450,000.

BIDS ASKED

Ark., Arkadelphia—School Dist. 1, bids about May or June 28, 2 story, basement, brick, concrete high school. $140,000. Petter & McAninch, Pyramid Life Bldg., Little Rock, archts.

Calif., Claremont—G. B. Kaufmann, archt., Union Bank Bldg., Los Angeles, taking bids rein.-con. library for Claremont College. $165,000.

Ind., Evansville—St. Anthonys Parish bids about June 1, 2 story basement, 66 x 217 ft., rein.-con., brick, limestone, terrazzo school, incl. gymnasium auditorium, Columbia St. and 2nd Ave. $150,000. E. C. Berendes, 121 Northwest 4th St., archt. Noted Apr. 23.

Ind., Laporte—May 16, by School Comrs., 2 story, basement, 78 x 217 ft., rein.-con., brick, steel high school. $150,000. W. W. Allen, 209 Savings Bank Bldg., archt. Noted Apr. 30.

Mass., Amherst—Bd. Trustees Amherst College taking bids (selected list of bidders), and open same about May 16, brick, stone theatre. $150,000. McKim, Mead & White, 101 Park Ave., New York, archts. Noted Apr. 16.

Mass., Everett—City, School Building Comn., bids about May 15, 2 story, basement, brick, limestone, steel addition to Junior High School, plain found., Bway. $500,000. Desmond & Lord, 1 Beacon St., Boston, archts.

N. J., Bloomfield—Bd. Educ., City Hall, bids about May 15, general contract 2 story, basement, brick, steel, rein.-con., Watchung and Broughton Aves. $300,000. Bartlett & Marsh, Lefcourt Bldg., Newark, archts. Noted Apr. 23.

N. J., Haledon (mail Paterson)—Bd. Educ., J. W. Grimshaw, 305 Haledon Ave., bids about June 1, general contract 2 story, basement, brick, steel, school, Barbour St. $150,000. J. Van Vlandren, 140 Market St., Paterson, archt. Noted Apr. 16.

N. J., Haledon—May 27, by Bd. Educ., School Bldg., general contract 2 story, basement, brick, steel, Barbour St. between Cliff St. and Lee Ave. $150,0000. J. C. Van Vlabndren, 140 Market St., Paterson, archt. Noted May 14.

N. J., Jamesburg—May 18, by Bd. Educ., J. Shaw, dist. clk., High School, general contract 2 story, basement, brick, steel high school, Buckelew and Davidson Aves. $150,000. J. N. Pierson & Son, 198 Jefferson St., Perth Amboy, archts. Noted Apr. 30.

N. Y., Jamaica—May 20, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, general contract P. S. 117, 84th Dr., 143rd and 144th Sts., for Bd. Educ., 500 Park Ave., New York. Noted May 7.

N. Y., New York—May 20, by W. C. Martin, archt. and supt. School Buildings, Flatbush Ave. extension and Concord St., Brooklyn, addition P.S. 52, Academy St. and Vermilyea Ave., for Bd. Educ., 500 Park Ave. Noted Apr. 17.

N. Y., New York—New York University, University Heights, bids about July 1 or later, general contract (1st unit) 5 story, 110 x 210 ft. gymnasium, University Heights. $158,250. Total $875,000. G. Haddon, 607 5th Ave., archt. F. Kimball, c/o owner, consult. archt. Noted May 1, 1930.

Pa., Wilkes Barre—May 15, by J. McCabe, pastor Holy Savior Parish 35 Worral St., East End, rein.-con., brick, school building, plain found., Worral St. $150,000. C. J. Schmidt, Wilkes Barre, archt.

Ont., Kenora—May 15 by M. Seegmiller, sec. Bd. Educ., 2 story, basement, concrete, stone, brick, steel high school. $150,000. Northwood & Chivers, Royal Bank Bldg., Winnipeg, Man., archts. Noted Apr. 16.

Que., Verdun—J. S. Archibald, archt., 1440 St. Catherine St. W., Montreal, taking bids addition to Woodlands School for Protestant School Bd. $250,000.

CONTRACTS AWARDED

Calif., San Francisco—Roman Catholic Archbishop, 1100 Franklin St., 3 story, steel, concrete school, 9th Ave. and Geary St., to Cahill Bros., 206 Sansome St., $150,000.

La., Baton Rouge — Bd. Supervs. Louisiana State University and Agricultural and Medal College, general contract 3 story, basement, 240 x 432 ft., rein.-con., brick, stucco women's dormitory, incl. small gymnasium, laundry, kitchenette, small infirmary, to J. V. and R. T. Burkes, Amer. Bank Bldg., New Orleans, $281,255; electric equipment and electric wiring, to Sullivan & Phillips, 117 Decatur St., New Orleans, $49,800; heating and plumbing, to Standard Plumbing & Heating Co., Baton Rouge, $57,000; elevators, to Otis Elevator Co., 852 Carondolet St., New Orleans, $4,460. Grand total $392,515. Noted Apr. 9.

Md., College Park—Smith & May, archts., Baltimore Trust Bldg., Baltimore, 3 story, basement, 66 x 115 ft. engineering building, 3 story, basement, 70 x 143 ft. girls dormitory, 2 and 3 story, basement, 100 x 186 ft. horticultural building, all foregoing brick, rein.-con., structural steel, for University of Maryland, to Price Contr. Co., Maryland Trust Bldg., Baltimore. Noted Apr. 16 Daily.

Mass., Arlington—Town, Building Com., and R. T. Jackson, archt., 44 School St., Boston, 3 story, basement, brick, limestone school, plain found., Eastern Ave., Brattle Sect., to Thomas O'Connor Co., 238 Main St., Cambridge. Est. $225,000. Noted Apr. 16.

Mass., Holyoke—City, Dpt. P. Wks., 3 story, basement, brick vocational school, plain found., to Caser Ranger Constr. Co., 20 Bond St., $133,780; plumbing, to E. H. Frederich Co., 73 Sargent St., $6,089; electrical work, to Coward & Coward, 94 Sycamore St., $13,779; heating and ventilating, to Holyoke Valve & Hydrant Co., Race St., $18,009. Grand total $171,657. Noted Mar. 19.

Mass., Millis—Town, School Bd., 2 story, basement, brick high school, concrete found., Main St., to R. H. Sewell, Central St., Franklin, $89,694.

Mo., St. Louis—St. Stephens Roman Catholic Parish, J. Hoelting, 3949 Wilmington Rd., 2 story, basement, 53 x 59 x 71 x 138 ft., rein.-con., brick, stone, school, auditorium, teachers home, 3900 Block Wilmington Rd., to Mississippi Valley Constr. Co., 821 Wainwright Bldg. Est. $150,000.

N. J., Woodbridge—Bd. Educ., Barron Ave., general contract School 16, 2 story, basement, brick, steel, to A. Anderson, Fords; plumbing, to G. W. Stillwell, 102 Market St., Perth Amboy; heating and ventilating, to Burns, Lane & Richardson, 301 Burnet St., New Brunswick; electrical work, to Coutts Electric Co., 323 Maple St., Perth Amboy. Est. $150,000. Noted May 7.

N. Y., Buffalo—Bd. Educ., 902 Genessee Bldg., altering Grover Cleveland High School, to Dunbar Constr. Co., 947 Ellicott Bldg., $75,000; plumbing, to C. Grimm, 259 Delaware Ave., $15,847; heating, to L. Castin, 1212 Michigan Ave., $4,652; electrical work, to Lackawanna Electric Co., 483 Ridge Rd., Lackawanna, $14,832. Grand total $110,331. Noted Apr. 28.

N. Y., Cheektowaga—Union Free School Dist. 11, general contract 3 story, 65 x 200 ft., brick, limestone school, to Queen Constr. Co., Check-

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Schools (Continued)

towaga, $120,000—electrical work to Modern Electric Co., 639 Main St., Buffalo, $13,989—heating to E. J. Leary, 209 Doat St., Buffalo, $20,310—and plumbing to Fish & Kronenberg, Hamburg, $7,969. Grand total $162,268. Noted Mar. 19.

N. Y., New York—Bd. Higher Educ., at office Secretary Hunter College, Park Ave. and 68th Sts., general contract gymnasium, for Hunter College, to T. G. Sperling, 103 Park Ave., $688,000. Noted Apr. 9.

Pa., Pittsburgh—See "Proposed Work."

S. D., Yankton — G. W. Nash, pres. Yanktown College, 4 story, basement, brick, steel dormitories, to Riesche & Sanborn, 3716 5th Ave., Sioux City, Ia., $58,590; plumbing and heating, to A. F. Luck, Watertown, $18,400. Noted Mar. 19.

Ont., Kingston—Bd. Educ., general contract 3 story, basement, concrete, brick, stone, steel high and technical school, to Charles Holbrook & Sons, 408 Elgin St., Ottawa; plumbing and heating, to McKelvey & Birch, 69 Brock St., Kingston; structural steel, to Desher Steel Constr. Co., 80 Commissioners St., Toronto; steel joists, to Sarnia Bridge Co. Ltd., Sarnia. Est. $300,000. Noted Mar. 26.

THEATRES

PROPOSED WORK

Calif., Long Beach—Fox West Coast Theaters, Inc., 1609 West Washington St., Los Angeles, plans by S. C. Lee, 2404 West 7th St., Los Angeles, Class A theater addition. $150,000.

Calif., Los Angeles—Fox West Coast Theaters, Inc., 1609 West Washington St., plans by S. C. Lee, 2404 West 7th St., Class A rein.-con. theater, 2,000 seating capacity, Florence Ave. $250,000.

Calif., San Jose—N. M. Parrott, et al., c/o Walker & Eisen, archts., 1031 South Bway., Los Angeles, Class A rein.-con., steel theatre, 1st and San Salvador Sts. $150,000.

Ont., St. Thomas—Famous Players Canadian Corp., 1201 Royal Bank Bldg., Toronto, plans by H. G. Duerr, Lumsden Bldg., Toronto, and soon takes bids 2 story, basement, 58 and 86 ft. wide x 168 ft. long, brick, concrete, stone, steel theatre, 1,500 seating capacity, Talbot St. $150,000.

BIDS ASKED

Calif., Alameda—Miller & Pflueger, archts., 580 Market St., San Francisco, taking new bids steel, rein.-con. theatre, North Central Ave., for Alameda Amusement Co., c/o architects. $500,000. Former bids rejected. Noted Feb. 5

Calif., Culver City—R.K.O. Pathe Studios, Washington Blvd., taking bids 1 story, 150 x 314 ft., steel, stucco, Class A stage building. $150,000. C. Decker, c/o owner, archt.

Calif., Los Angeles — C. G. Andres Co., 1 story, balcony, 82 x 155 ft., rein.-con. steel theatre, store, 522 South Bway., to J. M. Cooper Co., Inc., 320 Rives-Strong Bldg., $225,000.

BANKS

PROPOSED WORK

N. Y., Brooklyn—Fulton Savings Bank, 375 Fulton St. plans by DeYoung, Moscowitz & Rosenberg, 205 East 42nd St., bank, Flatbush and Caton Aves. $165,000.

OFFICES

PROPOSED WORK

Calif., Los Angeles—Braum Corp., 2260 East 15th St., soon lets contract two 2 story, one 85 x 327 ft., other 70 x 85 ft., rein.-con., steel, office laboratory and warehouse. $250,000. Walker & Eisen, 1117 Western Pacific Bldg., archts.

La., New Orleans—See "Piers and Wharves."

N. Y., New York—Corporation, c/o A. W. Ahlschlager, archt., 565 5th Ave., bids in July or later, general contract office, stores, 41st St., and 6th Ave. $2,000,000. Noted Feb. 26.

N. Y., New York—Corporation, c/o E. M. Krulewitch, 50 East 42nd St., 60 story, office, vicinity Wall St. To exceed $15,000,000 **Maturity in fall.**

BIDS ASKED

Conn., Hartford—May 15, by Hartford Steam Boiler Inspection & Insurance Co., W. R. Corson, pres., Grove and Prospect Sts., 3 story, basement office, 30,000 sq.ft. floor space, Prospect St. To exceed $150,000. C. J. Malmfeldt, 15 Lewis St., archt. Noted Mar. 5.

Mo., Kirkwood—May 21, by State Hy. Comm., Jefferson City, brick, concrete office, garage, T. H. Cutler, c/o owner, engr.

CONTRACTS AWARDED

Ia., Sioux City—C. F. Lytle, 504 Nebraska St., razing present building preparatory erecting 8 story, basement, 75 x 150 ft., terra cotta or stainless steel and aluminum office building, 5th and Pierce Sts., to G. W. Payne, 2609 Myrtle St. K. E. Westerlind, Badgerow Bldg., archt. Noted Apr. 23.

N. Y., New York—Continental Bank & Trust Co., 25 Broad St., 48 story office, 30 Broad St., to Thompson-Starrett, 250 Park Ave.

Pa., Phila.—See "Buildings—Unclassified."

STORES

PROPOSED WORK

Ark., Little Rock—Pfeifer Bros. Department Store, 514-24 Main St., plans by Thompson, Sanders & Ginocchio, Hall Bldg., Little Rock, and C. E. Swanson & Associates, 225 North Michigan Ave., Chicago, Ill., 4 story (ultimately 8 story), basement, 140 x 140 ft., concrete, brick, steel, Main and 7th Sts. $500,000.

Minn., Minneapolis—Pere Marquette Building Co., McKnight Bldg., plans by Larson & McLaren, 308 Baker Bldg., 2 story, basement, 165 x 198 ft. rein.-con., brick, stone, store, office, 2nd Ave. and South 8th Sts. $500,000. **Maturity in 1932.**

N. J., Montclair—Owner, c/o W. J. Fitzsimons, archt., 626 Central Ave., East Orange, will not build 3 story, basement, brick, steel, store, office. Project abandoned. Noted Apr. 23.

N. Y., Brooklyn— I. F. Realty Corp., I. Funt, pres., 2330 65the St., plans by B. Jalkouf, 375 Fulton St., 6 story, 140 x 200 ft., stores and apartments, 65th and Avenue O. $750,000.

N. Y., New York—Walton Avenue Building Co., 414 East 204th St., soon takes bids separate contracts 6 story store, apartment, Walton Ave. and 176th St. $180,000. Franklin Bates & Heindsmann, 2526 Webster Ave., archts. Noted Apr. 30.

BIDS ASKED

N. J., Hackensack—L. H. Friedland, archt., 562 Fifth Ave., New York, taking bids general contract 3 s tory, basement store, apartment, Essex St. and Prospect Ave., for Boundary Realty Co., S. Kraft, pres., Prospect Ave. $150,000.

N. J., Paterson—Island Market Corp., P. Alfano, in charge, 7 Bank St. and L. Bellomo, archt., 6 Park Ave., taking bids 2 story, basement, brick, steel store, office, storage, comfort station, Island Market Sect. $150,000. Noted Apr. 30.

N. Y., New York — St. Johns House, Inc., 1860 Bway., taking bids on separate contracts 19 story store, apartment, 1082 Amsterdam Ave. $450,000. G. F. Pelham, 570 7th Ave., archt. Noted Apr. 30.

CONTRACTS AWARDED

Calif., Sacramento—S. H. Kress Co., Western Pacific Bldg., Los Angeles, 2 story, basement, rein.-con., steel department store, to Lindgren-Swinerton, Inc., California State Life Bldg., $250,000.

N. J., Millburn—Seabright Corp., general contract 2 story, basement, brick, steel store, apartments, to Fatzler Co., 11 Hill St., Newark. Est. $150,000. Noted May 7.

N. J., Passaic—Krueger Bros., 507 45th St., Union City, general contract 1 story, basement store, garage, Main and Terhune Sts., to Mahoney-Troast Constr. Co., Inc., 657 Main Ave. Est. $150,000. Taking bids on subcontracts.

Tex., Beaumont—W. W. Kyle, Kyle Bldg., 1 and 2 story, 50 x 300 ft., rein.-con., brick, steel store, 80,000 sq.ft. floor space, plain found., to McDaniel Bros., Beaumont. $196,808. Noted Apr. 16.

PUBLIC

PROPOSED WORK

Conn., Litchfield—JAIL—Litchfield Co. Comn., State, State Comptroller, State House, plan new county jail. $200,000. Architect not selected.

Ind., Crawfordsville—CITY HALL—City plans by C. Beeson, 220 Ben Hur Bldg., brick, steel city hall. $150,000.

Mass., Norfolk—PRISON COLONY—Commonwealth of Massachusetts, Dpt. Correction, soon takes bids 3 story, basement, brick, rein.-con. administration building, concrete found., State Prison Colony, $150,000. McLaughlin & Burr, 88 Tremont St., Boston, archts.

Mass., Springfield—MUSEUM—City, Library Assn., bids about June or later, general contract Gray Art Museum, State and Chestnut Sts. $350,000. E. L. Tilton, 420 Lexington Ave., New York, archt. Noted Apr. 30.

Mass., Springfield—NATURAL HISTORY MUSEUM—City, Library Assn., bids probably in June, general contract natural history museum, E. L. Tilton, 420 Lexington Ave., New York archt. Noted Apr. 23.

N. J., Caldwell — BORO HALL — Bd. Boro Council, Boro Hall, revised plans by Guilbert & Betelle, 20 Branford Pl., Newark, 2 story, basement, brick, steel boro hall. $150,000. Noted Apr. 16.

N. J., Newark—FARMERS MARKET—Bd City Comrs., City Hall, 1 story, brick, $150,000. Project in abeyance. Noted Apr. 23.

R. I., Howard—REFORMATORY—State P. Welfare Dpt., State House, Providence, plans by T. H. Murphy, Jr., Howard, and soon takes bids, 3 story, brick, steel, concrete reformatory incl. ice plant. $500,000.

BIDS ASKED

Minn., St. Paul—CITY HALL and COURT HOUSE—June 3, by City of St. Paul and Ramsey Co., G. Bundlie, mayor, general contract 2 story, basement main building, with 17 story tower, 112 x 114 ft., 225 ft. high, steel, stone, 3rd, Wabasha, 4th and St. Peter Sts. $3,000,000. Holabird & Root, 104 South Michigan Blvd., Chicago, Ill., and Ellerbe & Co., 525 Minnesota Bldg., archts. Noted July 24.

CONTRACTS AWARDED

Conn., Hartford — OFFICE — State, State House, 3 story, 60 x 200 ft., brick, limestone, steel addition to present state office building (now under construction), to J. Henry Miller, Inc., Franklin Ave., Baltimore, Md., $185,000.

Pa., Reading—COURT HOUSE—Bd. Comrs. Berks Co., general contract 19 story, basement 65 x 229 ft., rein.-con., steel, limestone, plain found., to McCloskey Co., 1620 Thompson St., Phila., $1,309,132; plumbing to Corbitt Bros., 147 North 5th St., Phila.; heating, to D. J. Keating, 613 South 24th St., Phila., $99,725; electric wiring, to Reading Elec. Co., 6th and Chestnut Sts., Reading, $79,000. Grand total $1,548,968. Noted Apr. 9.

N. J., Woodbine—DORMITORY—Dpt. Institutions & Agencies, State Office Bldg., Trenton, general contract 1 story, basement 45 x 160 ft., brick, steel, dormitory at State Colony for Feebl-Minded, to H. J. Homan, 18th and Cherry Sts., Phila., Pa.; plumbing, to W. H. Kentner, 128 East Wildwood Ave., Wildwood; heating, to Hadley Contg. Constr. Co., 912 Washington Ave., Palmyra; electrical work, to W. E. Small, 226 Elmer St., Vineland. Est. $150,000. Noted Apr. 9.

UNCLASSIFIED

PROPOSED WORK

Mass., Walpole—MEMORIAL—Town, H. W. Caldwell, chm., Building Comm., plans by Putnam & Cox., 114 State St., Boston, brick and stone memorial building. $150,000. Noted Feb. 19.

Mass., Worcester — MEMORIAL — City, bids after May 25, general contract municipal memorial, Hirons & Mellor, 40 East 49th St., New York, archts. Noted Apr. 9.

Que., Quebec City — REFUGE — Director Domlesco Refuge, addition. $250,000.

BIDS ASKED

Calif., Los Angeles—MARKET and STORE—A. F. Norton, 111 South Manhattan Pl., taking bids separate contracts 1 story, mezzanine, 140 x 150 ft., brick, steel, Romaine and Western Aves. $150,000. R. L. Kent Co., 2394 South Brand Blvd., Glendale, archts. Noted Feb. 5.

Calif., San Francisco — WAR MEMORIAL, OPERA HOUSE, etc.—May 19, by San Francisco War Memorial, concrete, cement and masonry work for war memorial and opera house, Civic Center, for City and San Francisco Co. Total $5,000,000. Noted Apr. 9.

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Unclassified (Continued)

Ill., Joliet—EXCHANGE—May 20, by Holabird & Root, archts., 333 North Michigan Ave., 3 story, basement, 94 x 111 ft., rein.-con., brick, steel, plain found., Ottawa and Benton Sts., for Illinois Bell Telephone Co., 212 West Washington St., Chicago. $400,000.

Mass., Worcester—MUSEUM—May 18 (extended date), by Worcester Art Museum, F. H. Dewey, Sr., pres. Bd. Trustees, 3 story, basement, 110 x 150 ft., brick, stone, Salisbury St. To exceed $150,000. W. T. Aldrich, 30 Newbury St., Boston, archt. Noted May 7.

CONTRACTS AWARDED

Mich., Ishpeming—INN—Ishpeming Hotel Co., G. R. Jackson, in charge, 3½ story, basement, brick, to Pfeffer Constr. Co., 402 Builders Exch. Bldg., Duluth, Minn., $142,932. Noted Apr. 16.

Pa., Phila.—SHOW ROOM and OFFICE—Philadelphia Gas Wks. Co., Broad and Arch Sts., 2 story, basement, 65 x 140 ft., steel, brick, plain found., to F. M. Harris Co., 1520 Parrish St. Est. $175,000.

Industrial Buildings

FACTORIES AND MILLS

PROPOSED WORK

Calif., Burbank—FACTORY—Coopers, 750 South Los Angeles St., Los Angeles, 2 story, brick, concrete, 20,000 sq.ft. floor space, Front St. Private plans.

Ill., Joliet—MILK PLANT—Beatrice Creamery Co., 1526 South State St., Chicago, Ill., sketches rein.-con., brick. $200,000.

Ill., Joliet—FACTORY—Bitterman Steel Products Co., F. J. Bitterman, pres., sketches 90 x 200 ft. factory, Collins St.

Mass., Boston—FACTORY—Eastern Smelting & Refining Co., 109 West Brookline St., reconstructing 3 story, brick, recently damaged by fire. $40,000. Private plans.

Mass., Greenfield—ARTIFICIAL ICE PLANT—Greenfield Ice & Trucking Co., R. C. Phelps, Union St., 1 story, brick, steel, Bernardston Rd. $40,000. R. E. Palmer, 58 Suffolk St., Holyoke, engr. Machinery to be furnished by York Ice Mchy. Corp., 200 Causeway St., Boston.

Mass., Franklin — LAUNDRY and WAREHOUSE — H. Bullukin, 14 East Central St., brick, concrete, East Central St. Architect not selected.

Mass., Wareham—MILK STATION—Whiting Milk Co., 570 Rutherford Ave., Charlestown, milk station. $50,000 or more. Private plans.

N. J., Carteret — PLANT — Amer. Mineral Spirits Co., 205 East 42nd St., 1 story, basement, brick, petroleum products plant and tanks. $40,000. **Maturity after May 15.** Private plans. Noted May 7.

N. J., Paterson—FACTORY—J. S. Royal, c/o Lee & Hewitt, archts., 152 Market St., 2 story, basement, brick, steel. $40,000. **Maturity indefinite.** Noted Apr. 16.

N. Y., Brooklyn—FACTORY, etc.—C. H. Liebfried, 112 Dobbins St., soon takes bids general and separate contracts factory and light manufacturing plant, Guernsey St. and Norman Ave. $40,000. J. A. Napoli, 151 32nd Ave., Flushing, archt. Noted Apr. 30.

N. Y., Brooklyn—LAUNDRY—Corp. o/o H. Boslow, Walsof Corp., soon lets contract wet wash laundry Sheepshead Bay Rd. and West 6th St. $40,000. I. M. Fenichel, 468 4th Ave., New York, archt.

O., Bedford—FACTORY—Lempco Products Co., J. F. Strand, pres., Bedford, plans addition. $250,000.

Ore., Portland—FACTORY—S. Birkenwald Mfg. Co., 80 North 5th St., soon takes bids 1 story, 100 x 120 ft. addition, Pettygrove and 22nd Sts. $50,000. R. R. Clark, Railway Exch. Bldg., archt.

Pa., Bradford—REFINERY—Kendall Refining Co., J. B. Fisher, in charge, soon lets contract 2 story, 30 x 60 ft. brick, hollow tile, Kendall Ave. Private plans.

R. I., North Smithfield—PLANT—Branch River Wool Combing Co., Branch Village, soon lets contract 3 story basement, 95 x 170 ft., brick, steel, concrete sorting plant, storage building, plain found. To exceed $40,000. Lockwood Greene Engineers, Inc., 24 Federal St., Boston, Mass., engrs. Noted Mar. 5.

W. Va., Chester — CHINA PLANT — Harker Pottery Co., East Liverpool, O., purchased E. N. Knowles China Companies plant, here, and plans expending $200,000, 3 new tunnel kilns.

B. C., Vancouver — PLANT — Canada Rice Mills Ltd., 343 Railway St., extending existing plant, involving construction 600 ft. berth to accommodate steamers. $75,000-$100,000.

Ont., Oneida—WALL BOARD PLANT, etc.—Canadian Gypsum Co., Toronto, D. R. Rodgers, ch. engr., plaster mill, wall board plant, warehouse, incl. railway siding to connect with Canadian Natl. Ry. $100,000. Work will be done under supervision of Mr. Rodgers.

Ont., Tecumseh—CANNING PLANT—Fine Foods of Canada, Ltd., 37 La Belle Bldg., Windsor, subsidiary of Minnesota Valley Canning Corp., Le Seuer, Minn., plans by A. J. Lothian, La Belle Bldg., Windsor, probably 1 and 2 story, brick, concrete, steel, timber canning plant. $1,000,000.

Ont., Toronto—RADIO PLANT, etc.—Rogers-Majestic Corp., Fleet St., plans by Horwood & White, 229 Yonge St., 1 story, 44 x 56 ft. and 1 story, 44 to 84 ft. wide x 250 ft. long, brick, stone, concrete radio plant, warehouse, etc. $100,000.

Ont., Winona—WINERY—Grapegrowers Wines Ltd. plans by Kaplan & Sprachman, 305 Dundas St. W., Toronto, 2 story, 125 x 250 ft., rein.-con. $100,000.

BIDS ASKED

Ark., Ft. Smith — STEEL FENCE POST PLANT—See "Contracts Awarded."

N. J., Cresskill — PLANT — See "Contracts Awarded."

N. Y., Buffalo — PLANT — See "Contracts Awarded."

CONTRACTS AWARDED

Ark., Ft. Smith — STEEL FENCE POST PLANT—W. E. Womble & Sons, 300 Albert Pike St., 1 story plant, own forces.

Ia., Cedar Rapids—DAIRY PLANT—Co-operative Dairy Co., concrete brick, to J. W. Hopp Constr. Co., 415 Granby Bldg., $40,886.

Mo., St. Louis—BULK OIL STORAGE, etc.—Lacesig Oil Products, Inc., 314 North Bway., 1 story, 45 x 150 ft., brick, concrete bulk oil storage and distributing plant, to J. S. Alberici Constr. Co., Boatsmen's Bank Bldg. Est. $50,000.

N. J., Cresskill—PLANT—Harris Bros. Co., 2 story, basement, brick, steel, industrial plant, by separate contracts. $100,000. Private plans.

N. J., Trenton—FACTORY—C. V. Hill & Co., 360 Pennington Ave., 1 story, 100 x 250 ft. factory, to W. Burtin & Son, 25 Winder Ave., $45,000.

N. Y., Buffalo—PLANT—Du Pont Cellophane Co., 2 Park Ave., New York and River Rd., Buffalo, cellophane plant addition, separate contracts. $2,000,000. Private plans. Noted May 6 Daily.

N. Y., Buffalo—FACTORY—Trico Products Corp., 817 Washington St., general contract 1 story, 95 x 185 ft., rein.-con. top addition, 817 Washington St., to Crooker & Carpenter, Crosby Bldg., $60,000.

Pa., Bradford—REFINERY—Kendall Refining Co., 4,000 bbl. per mo. refinery distilling unit, to Alco Products, Inc., subsidiary Amer. Locomotive Co., Dunkirk, N. Y.

Pa., Phila — GAS TESTING STATION — Philadelphia Gas Wks. Co., Broad and Chestnut St., 1 story, 31 x 51 51 ft. and 11 x 47 ft., brick, steel, plain found., 7th St. and Passyunk Ave., to F. A. Havens Co., 845 North 19th St.

Ont., Leaside—TAR PRODUCTS PLANT—Canadian Bitumus Ltd., Kent Bldg., Toronto, 1 story, brick, steel, concrete, to Goldie Constr. Co., 32 Church St., Toronto. Est. $50,000.

Ont., Oakville—FACTORY—Heater of Canada Co., c/o W. B. Riddell, archts., Sun Life Bldg., Hamilton, 1 story, 50 x 281 ft., with 2 wings, concrete, brick, steel, to Stuart Bros., Ltd., 15 Hyde Park Ave., Hamilton; excavation, to King Eng. & Constr. Co., Oakville. Est. $50,000.

GARAGES

PROPOSED WORK

La., New Orleans—See "Piers and Wharves."

N. J., Jersey City—J. Goldenberg, 80 Woodland Ave., Englewood, will not build 4 story, 90 x 150 ft. garage, showrooms, Sip and Summit Aves. $150,000. Project abandoned. Permit to build denied. C. Shilowitz, 26 Journal Sq., archt. Noted Apr. 30.

N. J., Jersey City—J. Goldenberg, 80 Woodland Ave., Englewood, sketches by C. Shilowitz, 26 Journal Sq., 15 story, basement, brick, steel garage, plain found. $500,000.

N. J., Passaic—Jersey City & Nutley Bus Co. (Kruger Bros.), 537 Franklin Ave., Nutley, will not build garage. $150,000. Project abandoned. Noted Apr. 16.

N. Y., Brooklyn—S. Mariello, 2783 East 27th St., 1 story, 100 x 100 ft. service garage, Ralph Ave. and Carnarsie Lane. $40,000. **Maturity indefinite.** F. C. Deheimer, 8761 24th Ave., archt. Noted Apr. 30.

N. Y., Brooklyn—F. Nyse, 149 Van Sicklen St., bids late in August, general and separate contracts 1 story, 102 x 156 ft. brick, steel service garage, Lake St. and Avenue S. $40,000. W. Richter, 301 Elmwood Ave., archt. Noted Apr. 30.

N. Y., Brooklyn—M. Rubin, 430 5th Ave., auto laundry and garage, Coney Island Ave. and Avenue N. To exceed $40,000. **Maturity in August.** A. A. Beaustein, 1102 Kings Highway, archt. Noted Apr. 30.

N. Y., Brooklyn—Turnschless Holding Corp., 330 Douglas St., soon lets general and separate contracts service garage, Douglas St. and 4th Ave. $40,000. W. A. Lacerenza, 26 Court St., archt. Noted Apr. 30.

N. Y., Brooklyn—Wooster Lumber Co., 2126 Gravesend Ave., sketches by W. Richter, 301 Elmwood Ave., service garage, Avenue S and Lake St. $40,000.

N. Y., New York — Eight Hundred Forty Barry St. Corp., 704 133rd St., bids about June or later general and separate contracts service garage, Barry St. and Burnet Pl. $250,000. P. J. Murray, 14 West 45th St., archt. Noted Apr. 30.

BIDS ASKED

Mass., Cambridge—Pan-American Products Co., Park Sq. Bldg., Boston, taking bids 1 story, concrete service station. Private plans.

SHOPS AND FOUNDRIES

PROPOSED WORK

N. J., Roselle — MACHINE SHOP — Hubeny Bros., 615 East 1st Ave., will not build 1 story basement addition. $40,000. Project abandoned. Noted Feb. 19.

CONTRACTS AWARDED

N. Y., New York—SHOP—Consolidated Gas Co., 4 Irving Pl., 3 story shop, to Kenwell Contg. Co., 45 East 17th St. Est. $350,000. Noted Mar. 5.

Tex., Fort Worth—COACH YARD FACILITIES—Texas & Pacific Ry., c/o E. F. Mitchell, ch. engr., Dallas, general contract for 7 buildings, for cleaning, repairing and electrical charging, incl. general upkeep of coaches in need of repair, boiler shop and compressor room, coal bins, store and oil house, coach yard building, pullman car building, sterilizing building, to F. A. Mote, Constr. Industrial Bldg., Dallas.

POWER PLANTS

PROPOSED WORK

Kan., Fredonia—City light and power plant, Black & Veatch, 700 Mutual Bldg., Kansas City, Mo., engrs.

Mass., Taunton — Commonwealth of Massachusetts, Dpt. Mental Diseases, State House, Boston, altering boiler house, incl. two 250 hp. water tube boilers, brick stack, at State Hospital. $45,000 appropriated. Engineer not selected.

Miss., Starkville—City, c/o City Clerk, preliminary surveys light and power plant. $50,000. Swanson & McGraw, Balter Bldg., New Orleans, La., engrs.

N. Y., Brooklyn—Brooklyn and Queens Transportation Co., 3857 Flatbush Ave. extension, bids after May 18, general contract sub-station, Ocean H and Ocean Ave. $40,000. Private plans.

N. Y., New York—Shire Realty Co., 26 Court St., Brooklyn, 72 x 105 ft. boiler plant, storage, etc. 1220 Bway. Bids in, but indefinite when owner will award. Levy & Berger, 375 Fulton St., Brooklyn, archts. Noted Apr. 30.

N. Y., Rockaway Beach — Dpt. Hospitals, Municipal Bldg., bids in June, general contract boiler plant. Noted Sept. 25, under "Hospitals."

O., Norwood—Glove-Wernicke Co., Carthage Ave., 2 story, basement, brick, rein.-con. power plant, plain found., Carthage Ave. $250,000. Kinney & Ehlers, Inc., Dixie Terminal Bldg., Cincinnati, engrs.

Okla., Pryor—Grand River Power Co., Tulsa, W. Hudson, pres., hydro-electric plant on Grand River, near here. $2,000,000. Private plans.

BIDS ASKED

Kan., Dodge City—See "Contracts Awarded."

Kan., Fredonia—May 18, by O. C. Wilson, city clk., furnishing, erecting 600 kw. oil engine generating unit and auxiliaries. Black & Veatch, 701 Mutual Bldg., Kansas City, Mo., engrs.

Kan., Kansas City—See "Waterworks."

Que., Cedars—See "Contracts Awarded."

R. I., Wallum Lake—June 1, by State, Purchasing Agent, State House, Providence, furnishing, installing boiler, stoker and brick setting at State Sanatorium.

CONTRACTS AWARDED

Kan., Dodge City—Kansas Power Co., Topeka, smoke stack 104 ft. high, 10 ft. diam., for new power plant, to Alphonse Custodis Chimney Constr. Co., 140 South Dearborn St., Chicago, Ill., and 95 Nassau St., New York, close bids soon two 600 hp. boilers, 6,000 kw. turbine, air heaters. Sargent & Lundy, 20 North Wacker Dr., Chicago, Ill., engrs.

Que., Cedars—Montreal Light, Heat & Power Consolidated, 107 Craig St., Montreal, structural steel sub-station, own forces. Foundations under way.

WAREHOUSES

PROPOSED WORK

Calif., Los Angeles—See "Offices."

Kan., Colby—Syms-Shafer Grocery Co. soon takes bids 2 story, basement, 60 x 265 ft., rein.-con., brick, tile, steel cold storage building. $50,000. B. H. Byrnes, 312 Natl. Bank of America Bldg., Salina, Kan., archts.

N. Y., New York—Dpt. Hospitals, Municipal Bldg., plans by K. M. Murchison, 101 Park Ave., altering 9 story, central warehouse, Welfare Island. $40,000. **Maturity soon.**

Ont., Picton—Prince Edward County Co-operative, Ltd., Picton and Provincial & Dominion Governments, concrete, brick, steel cold storage plant for fruits and vegetables. $100,000. Margison & Babcock, McLean Bldg., Toronto, engrs.

CONTRACTS AWARDED

N. J., Hackensack—Hackensack News Co., 159 Moore St., general contract 1 story, basement newspaper warehouse, River St., to Ferber Constr. Co., 16 Johnson Ave.; steel, to Oltmer Iron Wks., Manhattan Ave., Jersey City; piling, to Stevens Alquest, Inc., 191 Main St.; plumbing and heating, to A. Rachles, 120 Columbia Ave., Passaic. Est. $150,000.

S. C., Hartsville—Hartsville Gas Corp. (now being formed), c/o Johnson-Church & Co., engrs., 149 Bway., New York, gas manufacturing plant and storage, separate contracts.

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